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O.W.R.C. Ind. Wastes Survey

Water management in Ontario

Ontario
Water Resources
Commission

135 St. Clair Ave. W.
Toronto 195, Ontario

INDUSTRIAL WASTES SURVEY

of the

CITY OF WINDSOR

1968

A

Report On

AN INDUSTRIAL WASTES SURVEY

of

THE CITY OF WINDSOR

1968

by

DIVISION OF INDUSTRIAL WASTES

ONTARIO WATER SOURCES COMMISSION

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SECTION I

AN INDUSTRIAL WASTE SURVEY OF THE CITY OF WINDSOR

1968

SUMMARY

The Industrial Waste Survey of Windsor carried out in early 1968 revealed that a high proportion of the total waste flow in the municipal sanitary sewer system was of industrial origin. As the automotive and allied industries contributed a majority of the industrial waste flow, the wastes in general exhibited high concentrations of oil, metals, BOD, and suspended solids.

Many plants were found to discharge wastes directly to water-courses and storm drains. These wastes were similar in character to those in the sanitary sewers and, therefore, in many cases failed to meet the OWRC's effluent quality objectives.

It was recommended that the municipality enforce its by-law for the protection of the sewer system and treatment works from physical damage and to maintain optimum operating efficiencies at the treatment plant. For this purpose a well organized programme of surveillance should be initiated. It was suggested that personnel be trained and facilities provided for the necessary testing and analyses required to carry out such a programme.

It was also recommended that the OWRC maintain close contact with industries discharging process wastes to the watercourses or storm sewers to insure that the OWRC objectives are being met. Industries with wastes of unacceptable quality should provide the necessary treatment to render them suitable for discharge to a watercourse or storm sewer, or to the sanitary sewer providing suitable prior arrangements have been made with the municipality.

At the time of writing, the industrial contribution was estimated to be about 38% of the designed hydraulic capacity of the municipal sanitary system. It also accounted for 33% of the total BOD, and 14% of the total suspended solids loadings in the system. The food processing and automotive industries were the chief sources of these industrial waste loadings.

Large quantities of heavy metals and other constituents were discharged from the metal working and plating plants. Such wastes not only have deleterious effects on sewers but would also be toxic to organisms employed in biological treatment processes. Batch discharges of very strong solutions were frequently encountered from the smaller plants in this category.

It was noted that more BOD and suspended solids were being discharged to storm sewers and watercourses than to the municipal sanitary sewerage system. Since the time of this survey, treatment works have been constructed at a number of the major industries, and waste streams diverted to the sanitary sewers and hence these loadings will have been reduced considerably.

DETAILS OF SURVEY

Conduct of Survey

This survey was carried out in two phases. The first phase included the collection of water consumption data and the selection of those plants to be investigated in depth. Of 459 industries in Windsor, 150 were visited during the second phase and, of these, 42 were surveyed in detail because of the nature of their operations and the volumes of wastewater discharged.

Composite and grab samples of the waste discharges were obtained and subsequently analysed at the OWRC Laboratories in Toronto. The data obtained was compiled and individual reports prepared for each of the 42 plants.

Industrial Water Supply and Usage

The majority of the industries obtain process, cooling and potable water from the Windsor Utilities Commission with the exception of Ford Motor Company of Canada Limited, Hiram Walker and Sons Limited, Canadian Salt Company, and the J. Clarke Keith Generating Station. These four plants pump approximately 85 mgd of water from the Detroit River most of which is used for cooling purposes.

In 1967 the Windsor Utilities Commission supplied an average of 9 mgd of water to commercial and industrial establishments. The 42 plants considered in this survey used a total of 6 mgd of which 4 mgd was process water.

Industrial Waste Disposal

At the time of the survey the total industrial wastewater discharge was approximately 94 mgd. Approximately 85% of this total was discharged directly to the Detroit River and 5% to the municipal sanitary or combined sewers. The remainder was discharged to Little River and the Grand Marais Drain. Part of the wastes carried in the sanitary and combined system was treated in the existing municipal pollution control facilities.

In addition to the wastes disposed of in the sewers and to watercourses there was 12,000 gallons per day of strong liquid wastes of industrial origin dumped in two municipal landfill sites. This procedure has resulted in the pollution of the Detroit River and Little River.

Municipal Sewage Facilities

There were a number of municipal pollution control facilities in operation in Windsor at the time of the survey. These were the Little River Plant (activated sludge), the Mark Avenue Plant (primary plant), the Avon Drive Plant (primary plant) and the municipal industrial lagoon. In addition,

there were several private treatment facilities. However, no treatment was provided for the majority of the wastes generated in the City.

At the time of writing there were a number of projects under construction and in the planning stage to provide the necessary services. Included in these was a 24 mgd primary treatment plant with effluent outfall to the Detroit River, a river front interceptor sewer, the Grand Marais interceptor sanitary sewer system and the Carron Avenue pumping station. At present, no plans for secondary treatment have been finalized.

GUIDELINES FOR INDUSTRIAL WASTE CONTROL

Under the terms of Section 27(1) of the Ontario Water Resources Commission Act, the discharge of any polluting material by any municipality, industry or person, to any watercourse is prohibited. To meet the requirements of the Act, the City of Windsor is constructing extensive sewage collection, transmission, and treatment facilities. Plans for the above works have been approved by the OWRC.

To protect the new municipal facilities the City of Windsor has enacted a Sewer-Use By-Law to control and regulate the discharge of materials that might adversely affect the municipal sewage collection system and interfere with the proper operation of the treatment works. It is important to maintain close control over the industrial waste discharges particularly when biological processes are utilized in a secondary treatment system. When such a by-law is enacted it is the responsibility of the municipality to administer and enforce it. The City of Windsor will require trained technical personnel to police and enfore the terms of the by-law by collecting the necessary effluent samples and carrying out periodic industrial waste surveys.

If the industrial wastes are discharged to a watercourse, storm sewer, drain, ditch, etc., the control over these effluents is within the jurisdiction of the OWRC. The quality of the effluent should comply with the OWRC objectives which are designed to protect and upgrade the quality of the receiving water. Industry is required to obtain approval of treatment and disposal facilities from the OWRC for such discharges prior to their installation.

Table 1 summarizes the requirements and objectives for the discharge of industrial wastes to storm, sanitary and combined sewers and to open watercourses, ditches, etc., in the City of Windsor. Storm sewer discharge requirements are listed under both the City By-Law Limits, and OWRC objectives. Inclusion of these in the City By-Law is necessary to provide ready remedy for nuisance conditions and to control or prohibit the discharge of any material that might have an adverse effect or prove harmful to the physical structures and to personnel involved in maintaining the sewers. The relevant materials here are flammable, toxic or explosive materials, radioactive substances, ashes, cinders, acidic wastes, etc.

One other important aspect of the By-Law which may be of vital importance in a heavily industrialized community, is the inclusion of a special agreement clause that would permit the municipality to accept an industrial waste which does not meet the By-Law requirements for discharge to a sanitary or combined sewer. In this instance the industry enters into an agreement with the municipality for the discharge of waste to the municipal sewers and the municipality may in turn require the industry to pay a fee for the treatment of the wastes at the municipal sewage treatment facilities. These wastes must be amenable to treatment and hydraulic capacity must be available in the treatment plant to handle them.

TABLE 1

REQUIREMENTS AND OBJECTIVES FOR INDUSTRIAL WASTES DISCHARGES

WASTE PARAMETERS	CITY BY-LAW LIMITS		OWRC OBJECTIVES TO WATERCOURSES, STORM SEWERS, DITCHES, ETC.
	COMBINED OR SANITARY SEWER	STORM SEWER	
BOD_5	500	15	15
Suspended Solids	600	15	15
Ether Solubles			
(a) Mineral Origin	15	0	(a combined value of 15)
(b) Animal Origin	150	15	
Cadmium	1	1	1
Copper	1	1	1
Nickel	2.5	1	1
Chromium	3	1	1
Lead	10	0	-
Zinc	10	5	5
Iron	-	17	17
Combination of Metals	20	20	-
Phenolic Compounds	0.05	0.02	0.02
Cyanides	2	0.1	0.1
Sulphates	1500	1500	1500
Chlorides	1500	1500	1500
pH	5.5 to 9.5	5.5 to 9.5	5.5 to 10.6

Note: all numbers refer to effluent concentrations in parts per million (ppm) except for pH.

DISCUSSION OF FINDINGS

Because the City of Windsor is situated near Detroit, much of its industry is orientated toward the production of automobiles. There are also many secondary industries which one would expect to find in a city of the size of Windsor.

Industry in Windsor can be classified into a number of distinct categories predicated on the type of operations and the character of the wastes generated. These classifications are discussed individually and then considered collectively.

(1) Automotive Components and Assembly Plants

This type of plant is primarily concerned with the manufacture of automobiles and finished automotive parts. In Windsor there are four assembly plants, two engine plants, two transmission plants, and two trim plants in this category.

The waste waters generated from assembly plant operations can best be described as organic in nature, containing high concentrations of suspended solids, and oil. These contaminants originate primarily from painting and paint sanding operations. In addition, heavy metals such as zinc, and chromium from the metal treating and bonderizing operations are encountered. Powerhouse wastes, cooling water and batches of spent solutions are also discharged.

Proper handling of the above wastes includes segregation of the cooling or uncontaminated waters from the high strength wastes. The contaminated wastes should be treated to adjust pH, and to remove oil, suspended solids, heavy metals, etc. Since a significant portion of the organic material is in the insoluble form, removal of suspended solids and oil would result in a reduction in the BOD and COD concentrations. This type of waste control is necessary whether the effluent is discharged to municipal sewers or to a watercourse.

Generally the wastes produced from engine and transmission manufacturing plants are like those already described since the processes generating most of the contaminated waste waters are similar. The machining of rough castings or blanks, during which soluble oil is liberally applied to the parts to facilitate cutting, is one of these operations. Other significant sources of liquid wastes from this type of industry include metal cleaning and preparation and painting.

Since emulsified oil is the chief contaminant, chemical pretreatment is required to break the emulsions and separate the mixture into oil and water layers. Some of the wastes contain heavy metals which must also be removed.

Automotive trim plants are not significant contributors of industrial waste waters as a major portion of the water is used for cooling purposes in welding, compressing and air conditioning equipment.

The three major waste contributors, at the time of writing, in the automotive group were the Ford Motor Company of Canada Limited, Chrysler Canada Limited, and McKinnon Industries Limited. Since this survey was undertaken, McKinnon Industries Limited and Chrysler Canada Limited have completed construction of waste treatment facilities to render the wastes acceptable for discharge to the sanitary sewer, and to the Grand Marais Drain, respectively. The Ford Motor Company of Canada Limited has embarked on an in-plant waste control programme and has obtained Commission approval of plans for waste treatment facilities.

Table 2 summarizes the data on the industries in the automotive category. In some cases it was necessary to estimate the concentrations of the waste constituents in the total plant effluent by extrapolating the data obtained for the constituent streams.

TABLE 2

CONTAMINATED WASTES FROM AUTOMOTIVE AND RELATED INDUSTRIES

	OPERATIONS	WASTE FLOW (GPD)	POINT OF DISCHARGE	SUSP. SOLIDS LBS/DAY	HEAVY METALS LBS/DAY	BOD5 LBS/DAY	ETHER SOLUBLES LBS/DAY	COD LBS/DAY	PHENOLS LBS/DAY
CHRYSLER CAN. LIMITED***	AUTOMOBILE ASSEMBLY	1,750,000	GRAND MARAIS DRAIN	15,500	150**	7,600	18,750	73,000	1
" "	ENGINE								
" "	TRUCK ASSEMBLY	250,000	SANITARY SEWERS	145	33	265	40	*	<1
" "	TRIM	125,000	COMBINED SEWERS	COOLING WATER ONLY					
FORD MOTOR CO. OF CAN. LTD.	TRANSMISSION ENGINE	56,400,000	DETROIT RIVER	47,600**	2,490**	*	7,460**	*	22**
MCKINNON INDUSTRIES LTD.***	TRANSMISSION	325,000	SANITARY SEWERS	975**	TRACE	825**	650**	*	*
GENERAL MOTORS OF CAN. LTD.	TRIM	11,000	SANITARY SEWERS	12	-	18	20	120	-
		72,200	STORM SEWERS TO LITTLE RIVER	4	TRACE	TRACE	TRACE	6	-
KAISER JEEP OF CANADA LIMITED	ASSEMBLY	9,000	SANITARY SEWERS	*	TRACE	*	*	*	*
WELLES CORP. LIMITED	ASSEMBLY	15,000	SANITARY SEWERS	*	TRACE	*	*	*	*
TOTAL TO COMBINED AND SANITARY SEWERS	-	735,000	-	1,140	33	1,108	710		<2
TOTAL TO OTHER DISPOSAL		58,222,000	-	63,100	2,640	7,600	26,210	<73,000	22

*NOT ANALYZED FOR

**BASED ON ESTIMATED WASTE CONCENTRATIONS

***WASTE LOADINGS PRIOR TO INSTALLATION OF WASTE TREATMENT FACILITIES

Foundry and Metal Working Plants

Approximately 50% of the industries visited during this survey can be classified as foundry or metal working plants. Products manufactured ranged from small tools and dies to structural steel components.

The wastes generated by industries in this category comprise of cooling waters and batch dumps which include coolants, cutting oils, chromates, alkaline cleaners, pickling acids and phosphates. Continuous waste flows consist of galvanizing wastes, parts wash waters, bonderite rinse wastes, foundry sand wash waters, vent gas scrub waters and plating wastes. The infrequent batch dumps of high strength wastes, and the discharge of copious quantities of clean uncontaminated cooling waters will be discussed later in this report.

Because of the variety of continuous wastes discharged, different treatment techniques have to be used. Alkaline cleaners and bonderite wastes can be handled in the same manner as automotive wastes, while the foundry wastes should generally be clarified before discharge to the sewer system.

Table 3 shows the pertinent data on the industries surveyed in this category. The foundry at the Ford Motor Company of Canada Limited was included in this table even though the plant is an integral part of the engine and transmission complex and was covered in the previous table.

Metal Electroplating Plants

Many exterior and interior automotive metal trim parts are electroplated for surface protection or for decorative purposes. There are ten plants in Windsor that carry out electroplating as an integral part of their operation.

Wastes generated from this industry are toxic and must be handled with caution whether discharged to a watercourse or a sanitary sewer. The toxic

TABLE 3

CONTAMINATED WASTES FROM FOUNDRIES AND METAL WORKING INDUSTRIES

NAME	OPERATIONS	WASTE FLOW (GPD) PROCESS	COOLING	POINT OF DISCHARGE	SUSP. SOLIDS LBS/DAY	BOD5 LBS/DAY	HEAVY METALS LBS/DAY	ETHER SOLUBLES LBS/DAY	BATCH DUMPS
BENDIX-ECLIPSE OF CANADA LTD. (2)	AUTOMOTIVE PARTS	(1) 50,000 (2) 9,000	135,000 50,000	COMBINE SEWERS (2)	* *	- -	4 *	* *	CAUSTIC CLEANERS (2500 GAL. PER MO.)
CHRYSLER CANADA LIMITED***	FOUNDRY	38,000	125,000	SANITARY SEWER AND STORM SEWER	*	-	*	*	-
COLONIAL TOOL COMPANY LTD.	TOOL AND DIE	-	12,500	COMBINED SEWER	*	-	*	*	PHOSPHATE AND SOLUBLE OIL (1000 GAL. PER WEEK)
DOSCO INDUSTRIES LIMITED	STRUCTURAL STEEL MEMBERS	15,000	154,000	COMBINED SEWER	*	-	-	*	PICKLE ACID (5000 GAL. PER 2 WEEKS)
FORD MOTOR COMPANY OF CANADA LIMITED**	FOUNDRY	9,200,000	1,600,000	DETROIT RIVER	27,000	-	-	*	-
KELSEY-HAYES CANADA LIMITED	AUTOMOTIVE RIMS	280,000	60,000	COMBINED SEWER	340	425	27	549	9 DIFFERENT DUMPS (AVERAGE 6000 GAL. PER MONTH)
LEEPO MACHINE PRODUCTS LIMITED	POWER TOOLS	2,900	600	COMBINED SEWER	*	-	*	*	SPRAY-BOOTH ONCE PER YEAR
NATIONAL AUTO RADIATOR MFG. CO. LTD.***	OIL PANS, ETC.	16,000	28,000	STORM SEWER	305	175	-	500	
TOTAL TO SANITARY AND COMBINED SEWERS	-	395,000	413,000	-	340	425	31	549	6250 GAL. PER WEEK (AVERAGE)
TOTAL TO OTHER DISPOSAL	-	16,000	153,000	-	305	175	-	500	-

*NOT ANALYZED FOR

**LOADINGS FROM THIS ESTABLISHMENT ARE NOT INCLUDED IN THE TOTALS IN THIS TABLE.

***PRIOR TO CONSTRUCTION OF WASTE TREATMENT WORKS

components consist of acids and ions such as chromium, zinc, copper, nickel, cadmium, and cyanide. Alkaline cleaners, grease and oil are also found in these wastes.

To control the waste discharges from this industry in-plant control measures should be implemented first to reduce the loss of chemicals to the sewers. The most common practices consist of:

(1) Construction of emergency catch basins to prevent the contents of ruptured tanks entering the sewer system.

(2) Reduction of drag-out by the use of drip pans and spray rinses over the respective plating baths.

(3) Use of high pressure fog rinses rather than high volume water washes.

(4) Use of still drag-out rinse tanks immediately following the electroplating operations.

Depending upon the effectiveness of the in-plant control measures further treatment should be provided to render the effluent suitable for disposal. Treatment could consist of segregation of wastes, chemical oxidation of cyanide bearing wastes, chromium reduction, neutralization, and finally settling or filtration to remove the metallic sludges. This type of industry also generates large quantities of spent solutions from the cleaning and plating operations. These spent solutions must also be treated before disposal.

Since the writing of this report, East Side Plating Company Limited and Noranda Copper Mills Limited (Plasticast Limited) have submitted to the OWRC applications for the approval of new waste treatment works. These new facilities are presently under construction and when completed should improve the quality of the waste discharges considerably.

Table 4 shows the pertinent data on the industries surveyed in this category.

TABLE 4

CONTAMINATED WASTES FROM METAL ELECTROPLATING OPERATIONS

NAME	PLATING WASTE FLOW (GPD)	POINT OF DISCHARGE	TOTAL CHROMIUM PPM	TOTAL CHROMIUM LBS/DAY	ZINC PPM	ZINC LBS/DAY	COPPER PPM	COPPER LBS/DAY	NICKEL PPM	NICKEL LBS/DAY	CYANIDES PPM	CYANIDES LBS/DAY	PH
CME CHROME LTD.	13,000	COMBINED SEWER	45	5.9	-	-	10.4	1.4	12	1.6	4.2	0.5	6.4
HAMPION SPARK PLUG O. OF CANADA LTD.	30,000	SANITARY SEWER	7.5	9.8	4	5.2	-	-	-	-	3	3.9	-
ANADIAN MOTOR LAMP OMPANY LIMITED	100,000	COMBINED SEWER	-	85	-	-	-	-	-	-	-	-	3.0 TO 3.7
AST SIDE PLATING OMPANY LIMITED*	270,000	LITTLE RIVER	-	5.4	-	-	-	-	-	29.7	-	-	1.7 TO 11.5
NDUSTRIAL PLATERS	90,000	SANITARY SEWER	1.1	1	8	7.2	1.8	2	2.5	2.2	3.7	3	7.2 TO 9.5
ORANDA COPPER MILLS LTD.*	160,000	GRAND MARAIS DRAIN	2.8	4.5	-	-	13	21	19	30.4	4.2	7	7.5
INDSOR CHROME PLATING OMPANY LIMITED	9,500	STORM SEWER TO GRAND MARAIS DRAIN	0.1	TRACE	-	-	-	-	10.1	1	-	-	2.0
ENDIX-ECLIPSE CAN. LTD.	15,000	SANITARY SEWER	-	-	1.3	0.2	23.2	3.5	-	-	4.4	0.7	-
NIMCO LIMITED	15,000	SANITARY SEWER	-	-	-	-	3	TRACE	12	2	30	4.5	6.8 TO 10.0
USTSHIELD PLATING LTD.	9,500	COMBINED SEWER	-	-	9.6	1	-	-	-	-	0.1	TRACE	6.0
OTAL TO SANITARY AND OMBINED SEWER	282,000	-	-	102	-	13.6	-	7	-	6.8	-	12.6	-
OTAL TO OTHER SOURCES	430,000	-	-	9.9	-	-	-	21	-	61	-	7	-

*PRIOR TO CONSTRUCTION AND/OR IMPROVEMENT OF WASTE TREATMENT WORKS.

Food Processing Industries

Industries covered in this category are those engaged in the production of edible goods for human consumption. This group consists of dairies, fermentation plants, soft drink bottlers, meat packing plants, a potato chip plant, etc.

Wastes from the food processing industry include cooling and wash waters, waste by-products, process wastes and occasional dumps of actual products not meeting the required specifications. The effluents exhibit high BOD and suspended solids concentrations, which in many cases are higher than those found in domestic sewage. Food processing wastes are essentially organic in nature and hence are normally amenable to treatment in municipal facilities.

Industries in this category, particularly meat packing and dairy plants, should attempt to ensure that waste loadings are maintained at minimum levels. This can be accomplished by recovering as saleable by-products materials such as blood, inedible or edible fats, whey, skim milk, etc., and by applying stringent in-plant control measures to prevent solids and other high strength waste flows from reaching the sewers.

Since this survey, Essex Packers Limited and the Carling Breweries Limited have ceased operations and this has eliminated two high strength waste flows. Hiram Walker and Sons Limited has embarked on an intensive in-plant control programme to reroute the process wastes from the Detroit River to the municipal sanitary sewer system. Once completed, wastes from one of the major sources of pollution will be receiving treatment.

TABLE 5

CONTAMINATED WASTES FROM FOOD PROCESSING INDUSTRIES

NAME	TYPE OF INDUSTRY	TOTAL WASTE FLOW (GPD)	POINT OF DISCHARGE	BOD5 LBS/DAY	SUSP. SOLIDS LBS/DAY	ETHER SOLUBLES LBS/DAY	PRETREATMENT
ORDEN COMPANY LIMITED	DAIRY	85,500	SANITARY SEWERS	127.5	43	*	NONE
ANNINA CHEESE MANUFACTURING	CHEESE	2,500	SANITARY SEWERS		30	*	NONE
URITY DAIRIES LIMITED	DAIRY	125,800	COMBINED SEWERS	285	95	*	NONE
ILVERWOOD DAIRIES LIMITED	DAIRY	115,000	MUNICIPAL LAGOON THEN TO GRAND MARAIS DRAIN	530	175	*	MUNICIPAL LAGOON
VIN PINE DAIRY	DAIRY	25,000	COMBINED SEWERS	258	83	*	NONE
ARLING BREWERIES LIMITED***	BREWERY	200,000	SANITARY SEWERS	240	135	*	IN-PLANT CONTROL
IRAM WALKER AND SONS LIMITED**	DISTILLERY	8,200,000	DETROIT RIVER	13,000	8,300	*	IN-PLANT CONTROL
ANADA DRY BOTTLING COMPANY LIMITED	SOFT DRINK	21,700	COMBINED SEWERS	----NEGLIGIBLE----			NONE
OCA COLA LIMITED	SOFT DRINK	40,000	COMBINED SEWERS	----NEGLIGIBLE----			NONE
USH BOTTLING COMPANY	SOFT DRINK	10,000	SANITARY SEWERS	----NEGLIGIBLE----			NONE
VEN UP BOTTLING CO. (WINDSOR) LTD.	SOFT DRINK	13,000	COMBINED SEWERS	----NEGLIGIBLE----			NONE
SEX PACKERS LIMITED***	MEAT PACKING	125,000	COMBINED SEWERS	2,030	570	*	IN-PLANT CONTROL
NDSOR PACKING COMPANY LIMITED	MEAT PACKING	180,000	SANITARY SEWERS	5,170	1,980	490	IN-PLANT CONTROL
IUNG KING CORP. OF CANADA LTD.	FROZEN FOOD	120,000	COMBINED SEWERS	----NEGLIGIBLE----			NONE
IUNCHEE POTATO CHIP COMPANY	POTATO CHIPS	25,000	SANITARY SEWERS	125	96	*	
INTY FOODS LIMITED	RICE PRODUCTS	7,500	SANITARY SEWERS	95	90	*	SCREENING
Y-ZEE FOOD PRODUCTS LIMITED	FRUIT JUICE	54,000	COMBINED SEWERS	575	225	*	SCREENING
ETH (J) AND BROS. (CANADA) LTD.	PHARMACEUTICALS	34,300	COMBINED SEWERS	115	45	14	NONE
TAL TO COMBINED AND SANITARY SEWERS	-	1,070,000	-	9,340	3,400	504	
TAL TO OTHER POINTS OF DISCHARGE	-	8,315,000	-	13,530	8,475		

*NOT ANALYZED

**PRIOR TO IN-PLANT SEWER CHANGES

***CEASED OPERATIONS

Miscellaneous Industries

Industries in this category cover the remaining plants having significant waste discharges to municipal sewers or to watercourses that were visited during this survey.

TABLE 6

LOADINGS FROM MISCELLANEOUS INDUSTRIES

NAME	TYPE	VOLUME OF WASTE (gpd)	POINT OF DISCHARGE	CONTAMINATION
Canadian Salt Co. Ltd.	Common Salt	6,750,000	Detroit River	Susp. solids Chlorides
Duplate Canada Ltd.	Glass	180,000	Combined Sewers	Susp. Solids Ether Solubles
Gelatine Capsules Ltd.	Gelatine Capsules	2,150	Septic Tank and Sanitary Sewer	BOD
J. Clark Keith Generating Station	Hydro	13,500,000	Detroit River	Thermal
R. P. Scherer Ltd.	Gelatine Capsules	11,000	Sanitary Sewer	BOD
TOTAL TO DETROIT RIVER		19,250,000	SUSPENDED SOLIDS 390 lbs/day	
TOTAL TO SANITARY OR COMBINED SEWERS		193,000	SUSPENDED SOLIDS 30 lbs/day	

Combined Effects Resulting from the Disposal of Liquid Industrial Wastes.

The industrial wastes from a majority of the plants in Windsor are presently discharged to the municipal sewerage system and as a result they must be controlled for the successful operation of the municipal sewage treatment plant. The total BOD waste loading to the municipal sanitary and combined sewers was found to be about 11,000 lbs per day representing a population equivalent of 67,000 people or 1/3 of the total population of greater Windsor. Over 85% of this industrial BOD loading can be directly attributed to the food processing industry of which the main contributors at the time of writing were the two meat packing plants and the dairies. The remaining BOD loading originated from the automotive assembly and related plants.

It was also found that approximately 5,200 lbs of suspended solids were discharged daily from industrial sources to the municipal sewers. Approximately 65% of this total was attributed to the food processing industry while a large portion of the remainder originated from the automotive plants.

In a properly designed and operated primary treatment plant there is about a 40 to 70 per cent removal of suspended solids and a 25 to 40 per cent removal of BOD. As the food processing industry discharges process wastes containing high concentrations of colloidal and dissolved solids which are not removed by simple sedimentation, wastes from industries in this category will have a marked effect on the effluent leaving the sewage treatment plant. The municipality should therefore place considerable emphasis on the need for in-plant control and pretreatment at the responsible industries.

The total metal loading, made up of chromium, nickel, copper, zinc, etc., discharged to the municipal sewers was found to be approximately 200 lbs per day. The major contributors were the electroplating shops and the

automotive industries, with one industry - Canadian Motor Lamp Company Limited - contributing 85 lbs to this total. Significant reductions at this plant are not anticipated because the treatment facilities considered were only designed to reduce the hexavalent chromium to the trivalent state and not to remove the metal as an insoluble hydroxide.

Only a limited removal of metal from a waste is expected at a primary plant depending upon the pH of the raw sewage entering the plant. If the pH of the influent is in the range of 8.3 to 8.5 a majority of the metals may be taken out as an insoluble metal hydroxide. If the pH is not conducive to hydroxide formation the metals would probably exit in the soluble form to the Detroit River.

Cyanide bearing wastes should be carefully controlled because of the health hazards associated with their discharge. When cyanide wastes are discharged in conjunction with acidic wastes, deadly hydrogen cyanide gas is liberated that could be trapped and accumulated in the sewers thereby posing a health hazard to sewer maintenance staff. Industries utilizing cyanide were found to control their waste discharges effectively with the exception of Unimco Limited where the cyanide concentration in the effluent was found to approach 30 ppm.

Cyanides and metal ions have extreme toxic effects on bacterial colonies essential for most secondary sewage treatment processes. These effects are well documented in literature and may be cumulative or instantaneous depending whether the waste is introduced to the activated sludge as a continuous high strength waste or a dump of concentrated solution. Since there is a distinct possibility that secondary treatment may be added to the primary section, the municipality should emphasis the need for control of these wastes at the responsible industries. The discharge

of such wastes can also interfere with the operation of anaerobic digesters.

There are numerous plants in Windsor, that have "batch dumps" or intermittent discharges of chemical wastes to the sewer system. These chemical dumps include paint spray booth waters, spent plating solutions, bonderizing baths, pickling liquors and alkaline cleaners. Intermittent discharges of wastes having high or low pH could cause serious corrosion problems in the sewers. High strength intermittent discharges should be subjected to suitable treatment before disposal.

During the survey it was found that approximately 1.8 mg per day of clean cooling water was being discharged to the sanitary sewer system. This flow will occupy approximately 7% of the total available hydraulic capacity at the new sewage plant and, therefore, it is recommended that these wastes be segregated for discharged directly to a storm sewer or watercourse where possible.

Based on the evidence of this survey it is imperative that the City of Windsor enforce the Sewer-Use By-Law to control the quantity and quality of the industrial waste discharges to the sanitary sewerage system. This can be accomplished by employing trained personnel to conduct detailed industrial waste surveys, to assess and collect surcharges for sewer use, to police special agreements between the City and industry, and to enforce the general terms of the by-law.

The City of Windsor should also examine the ramifications of the ever increasing hydraulic waste loadings discharged by industry to the sanitary sewers as this could seriously effect the capacity for future population and industrial growth in the area. In the previous five years the industrial water consumption and corresponding industrial waste discharge had

increased between 5% to 10% per year. To keep abreast of the need for obtaining more treatment capacity under these conditions, the municipality should encourage tighter control of process wastes at the industry, the elimination of uncontaminated wastes from the municipal system, and the judicious use and/or re-use of water at the industries. Finally, the need for a higher degree of treatment in order to protect and upgrade water quality is a vital factor that should be recognized by the City of Windsor and for this reason the municipality should seriously consider the addition of secondary sewage treatment facilities to complement the existing works.

The major portion of the industrial wastes generated in Windsor are discharged to the local watercourses and storm sewers. Although a high percentage is clean cooling water, at the time of writing approximately 13,000 lbs per day BOD, 50,000 lbs per day suspended solids, and 2,500 lbs per day of metals were discharged to the Detroit River. At the same time it was estimated that 8,300 lbs per day BOD, 16,000 lbs per day suspended solids and 280 lbs per day of metals were discharged to the Grand Marais Drain; and approximately 40 lbs of metals to the Little River.

However, since the writing of this report, a number of the major industries have either completed construction of new waste treatment facilities, or have submitted proposals to the OWRC for the approval of new works. McKinnon Industries Limited, Chrysler Canada Limited and National Auto Radiator Manufacturing Company Limited now have new waste treatment works installed and operating while the Ford Motor Company of Canada Limited has applied and received approval from the OWRC to construct waste treatment works. Hiram Walker and Sons Limited is in the process of rerouting the process wastes for discharge to the sanitary sewers thereby reducing considerably the BOD and suspended solids loadings to the Detroit River. Two major plating establishments, East Side Plating Company Limited and Noranda Copper Mills Ltd.

(Plasticast Limited) have received approval from the OWRC for the installation of new waste treatment facilities. Once these works are in full operation the metal loadings to Little River, and the Grand Marais Drain will be reduced considerably.

CONCLUSIONS AND RECOMMENDATIONS

Industrial waste discharges in the City of Windsor will make up a significant portion of the total flow to the primary treatment works presently under construction. At the time of writing, this waste volume was estimated at 3.4 mgd contributing approximately 11,000 lbs per day BOD, and 3,200 lbs per day suspended solids. The industrial waste loadings to watercourses, storm sewers, ditches, drains, etc., were found to be 21,300 lbs BOD and 72,300 lbs suspended solids in a flow of 88 mgd. About 95% of the above flow was made up of relatively uncontaminated cooling waters.

The food processing and automotive manufacturing plants contributed a major portion of the loadings discharged to both the sanitary sewers and natural watercourses. The metal loadings to the sewers and watercourses originate from the metal working and metal plating plants.

Table 7 summarizes all the industrial effluents in Windsor noting their point of discharge as well as the major waste components. This table includes the waste flows from the major industries as well as those from smaller operations which account for a combined daily waste discharge of 3.1 mg. The figures in the table were obtained by summarizing the contributions made by the 42 major concerns and then adjusting the totals to include the contribution of the smaller establishments based on a knowledge of their size, operations and points of discharge.

TABLE 7

SUMMARY OF INDUSTRIAL WASTE DISCHARGES IN WINDSOR

POINT OF DISCHARGE	VOLUME (mgd)	AVERAGE DAILY LOADINGS (lbs/day)						
		BOD	SUSP. SOLIDS	METALS				
				Iron as Fe	Chromium as Cr	Nickel as Ni	Copper as Cu	Zinc as Zn
Municipal Sanitary and Combined Sewers	6.	10,850	5,200	-	150	40	10	10
Grand Marais Drain	2.3	8,300	16,000	160	60	30	20	10
Detroit River	85.4	13,000	56,300	2,500	-	-	-	-
Little River	0.4	-	-	-	10	30	-	-
TOTAL INDUSTRIAL DISCHARGE	94.1	32,150	77,500	2,660	320	100	30	20

Based on the findings of this survey the following general recommendations are offered as a guide for the control of industrial wastes in Windsor. More specific recommendations on the individual industries may be found in Section II of the report which discusses the major industries on a separate basis.

I All industries presently discharging liquid industrial wastes to the sanitary, combined, or storm sewers should provide, if necessary, pretreatment facilities or in-plant control measures to insure that the waste discharges comply with the OWRC objectives or limits set out in the City of Windsor Sewer-Use By-Law.

II Because a significant portion of the industrial wastes is discharged to the municipal sewerage system, it is evident that the City of Windsor should play a major role in getting industry to regulate and control the quality and quantity of these waste discharges. This can be accomplished by effective policing and enforcement of regulations contained in its Sewer-Use By-Law and by close contact and co-operation with industry. To this end the municipality should retain staff and provide the necessary facilities to carry out such a programme.

III Where possible the municipality should insist that the uncontaminated waters be excluded from the sanitary or combined sewer system as they tend to take up useful hydraulic capacity at the sewage treatment plant.

IV The City of Windsor should keep abreast of the needs of an expanding municipality as industrial and population growth takes place. Stringent water quality criteria for discharge of wastes to the watercourse, may require the municipality to accelerate its plans for secondary treatment facilities for the City of Windsor.

V The OWRC should maintain close contact with industries discharging contaminated wastes to storm sewers or natural watercourses. These industries should be required to provide the necessary treatment works to insure that the waste discharges meet the OWRC objectives and are not a source of water pollution.

SECTION II

CHRYSLER CANADA LIMITED

Chrysler Canada Limited operates three plants in the Windsor area which are geared for the manufacture of automotive engines and the assembly of trucks and automobiles.

These three plants were surveyed by staff of the OWRC in March 1966. Special emphasis was placed on the operations and resulting sources of wastes in the engine manufacturing plant (Plant #2) and the automotive assembly plant (Plant #3), since these wastes were discharged directly to the Grand Marais Drain whereas the wastes from the truck assembly plant (Plant #1) were directed to the municipal sanitary sewers.

The March 1966 survey indicated that the industrial wastes from Plants #2 and #3 discharging into the Grand Marais Drain were of unsatisfactory quality for direct discharge to a watercourse. The OWRC objectives were exceeded in terms of BOD_5, suspended solids and ether solubles.

Since the survey of 1966, Chrysler has completed the construction of facilities for the collection and treatment of the contaminated wastes from Plants #2 and #3. These facilities were placed in operation in late 1968.

As these significant changes were underway during the conduct of the municipal survey no sampling or survey work was carried out in Plants #2 and #3, but information and data compiled in the 1966 report are used in this presentation. Data on processes, sources of wastes and means of disposal of these wastes in the Truck Assembly Plant (Plant #1) were obtained during a visit to this plant on May 9, 1968.

DETAILS OF SURVEY

Plant #1 was visited on May 9, 1968 and samples of the waste effluents taken.

Personnel Interviewed

Mr. D. Osmun	- Project Engineer	(Car Assembly Plant)
Mr. D. Hartshort	- Engineering Department	(Engine Plant)
Mr. H. Maenpaa	- Engineering Department	(Truck Plant)

Description of Plant Processes

Car Assembly Plant (Plant #3) - The main operations carried out in this plant are geared to the production of a finished automobile. First, the stamped body parts are welded together to form the car body and this is then treated for rust protection in a bonderite unit, prime-coated and painted. Finally, the interior parts and trim are added and this unit is then joined to the chassis and engine assembly, to produce the complete product.

Engine Plant (Plant #2) - The operations in this plant are principally concerned with the machining and assembly of rough castings into engine blocks followed by the addition of other pre-finished components, such as carburetors and fuel pumps, to the engine blocks to produce the finished product. The engines are painted and tested prior to shipping to assembly plants.

Truck Assembly Plant (Plant #1) - The operations in this plant are essentially similar to the operations in the Car Assembly Plant, only on a smaller scale.

Operating Data

Employees	-	3,000
Operating Schedule	-	16-24 hours/day 5 days/week
Raw Materials	-	Pre-cast, stamped and finished automotive parts
Products	-	Engines and assembled cars and trucks

Water Supply and Distribution

Plants #2 and #3:

Supply	-	Municipal Supply
Volume (average over 1967)	-	1,800,000 gpd

Distribution

Sanitary and Domestic	50,000 gpd
Process	1,600,000 gpd
Other Uses (boiler etc.)	150,000 gpd
	1,800,000 gpd

Plant #1:

Supply	-	Municipal Supply
Volume (average over 1967)	-	320,000 gpd

Distribution

Sanitary and Domestic	25,000 gpd
Process	250,000 gpd
Other Uses (cooling etc.)	50,000 gpd
	325,000 gpd

Sources of Liquid Wastes and Disposal

Plant #1 (Truck Plant) - Wastes from this plant include bonderizing rinses, water from water-walled paint spray booths, rinses after primer-coat, cooling waters and sanitary wastes. All liquid wastes from this plant are discharged to combined city sewers on McDougall Street.

Plant #2 (Engine Plant) - The majority of waste water from this plant originates from the batch discharges of water-soluble coolants from some 380 machines, leakages and spills of coolant machine oil and lubricants, rinses from 19-oil-removal washers, floor washups, paint spray booth dumps, cooling waters, and sanitary wastes. The major portion of the industrial wastes were discharged to the Grand Marais Drain untreated in May, 1968.

Plant #3 (Body Assembly Plant) - Wastes from this plant include bonderizing rinse wastes, water test area drainage, water-walled paint spray booth dumps, various other chemical batch dumps and sand deck wastes. These wastes were discharged to the Grand Marais Drain untreated in May, 1968.

Sampling and Analysis

Composite samples were taken on May 8, 1968, of the contaminated or process effluents from the Truck Assembly Plant (Plant #1) which were discharging to the combined sewer on McDougall Street. The analytical results of these samples were:

Sample Number	Flow gpd	BOD_5	Solids		Chromium		pH at Lab.	Ether Solubles	Zinc as Zn
			Total	Susp.	Total	Hexa.			
1	150,000	3	390	48	1.7	1.4	7.0	12	2.6
2	40,000	460	746	83	24	21	6.1	31	12

Sample Description

1. - Composite of Effluent from the Bonderite Area

2. - Composite of Effluent from the Paint Area

The analytical results of samples taken by the OWRC of the effluent from the Car Assembly and Engine Plants to the Grand Marais Drain on March 9, 1966 were:

Sewer	BOD_5	Solids		COD	Ether Solubles
		Total	Susp.		
60"	505	1,340	1,093	4,993	1,310
27"	145	376	70	638	103

All analyses except pH reported in parts per million

WASTE LOADINGS

The exact flow breakdown on the two sewers from Plants #2 and #3 are not known, but assuming the 60" sewer takes about four times the flow in the 27" sewer, the total waste loadings to the Grand Marais Drain from these two plants before treatment works were installed are summarized as follows:

BOD_5	- 7,600 lbs/day
Suspended Solids	- 15,500 lbs/day
COD	- 73,000 lbs/day
Ether Solubles	- 18,750 lbs/day

In addition to the above loadings there would also be a significant metal loading. Since metals were not analysed for during the 1966 survey it will be assumed from previous visits to similar manufacturing plants and from literature sources, that about 10 ppm total metals exist in the effluent from Plants #2 and #3. On this basis the metal loading would be in the order of 150 lbs/day and would comprise mainly of chromium, iron, zinc and aluminium.

In Plant #1, there are three outfalls to the McDougall Street sewer but only two were sampled during this survey so that to arrive at a meaningful waste loading from the entire Plant #1, it will be assumed that the wastes from the Annex Section on Hanna Street are of the same composition and of the same breakdown as the two flows in the main Plant #1 operating area. This assumption is made on the grounds that operations in the Annex section are exactly the same as those in the main plant.

The flows and waste loadings from the main production section are:

Flow	-	190,000 gpd
BOD_5	-	200 lbs/day
Suspended Solids	-	110 lbs/day
Total Chrome	-	15 lbs/day
Total Zinc	-	10 lbs/day
Ether Solubles	-	30 lbs/day

On this basis, the waste loadings from the Annex Area and the total Plant #1 are:

		Waste Loadings				
	Flow gpd	BOD_5 lbs/day	Susp. Solids lbs/day	Chromium lbs/day	Zinc lbs/day	Ether Solubles lbs/day
Annex	60,000	65	35	5	3	10
Total Plant #1	250,000	265	145	20	13	40

DESCRIPTION OF WASTE TREATMENT FACILITIES INSTALLED SINCE MAY 1968

These facilities are sized for the treatment of 2.2 mgd of wastewater containing soluble and insoluble oils from Plants #2 and #3, and consist of three stages of treatment involving batch treatment tanks, flotation clarifiers, and final clarifiers. The oil sludges, purged from the system, are disposed of by incineration. Considerable flexibility has been incorporated in the design so that storm water and oily wastewater during heavy rainfall can be collected in a storm water detention pond with the provision added to allow the contents of this pond to be drained to the waste treatment facilities.

DISCUSSION OF RESULTS

The industrial wastes from Chrysler Corporation Limited Plants #2 and #3 discharging to the Grand Marais Drain were unacceptable in terms of the OWRC objectives in May, 1968. This situation has been corrected since that time through installation of an integrated waste treatment plant.

The results obtained from samples of the effluents from Plant #1 are typical of the automobile assembly operations where the main waste producing operations are bonderizing and painting.

The wastes from this plant are directed to the municipal combined sewer on McDougall Street and, as a result, do not need the same degree of treatment necessary for discharge to a watercourse. However, it should be pointed out that the chromium, zinc and oil concentrations in the wastes from the painting area, exceeded the limits prescribed in the City Sewer-Use By-Law. Some consideration should be given to reducing the concentration of these contaminants by in-plant control measures and/or segregating and treating the high strength wastes.

Of far greater importance, however, is the intermittent discharge of high strength acid and alkaline cleaners, and spent chromic acid sealers. While the acid and alkaline cleaners could be combined to promote neutralization, the elimination of the chromium is not accomplished in such an easy manner. Conventional treatment processes for chromium wastes may be employed and these involve reduction of hexavalent chromium to the trivalent state by the addition of sulphur dioxide or sodium bisulphite, followed by neutralization and removal of the resulting precipitate.

CONCLUSIONS AND RECOMMENDATIONS

The waste flows emanating from the Plants #2 and #3 were unacceptable for discharge to a watercourse. However, this industry has since constructed facilities for the treatment of these industrial wastes and this has corrected the problem.

The waste waters from Plant #1 which are discharged to the municipal combined sewers were found to be acceptable with the exception of those from the paint area which failed to meet certain limits prescribed in the City of Windsor Sewer-Use By-Law. It is recommended that steps be taken by the industry to meet the By-Law limits by in-plant control measures and/or segregation and treatment of high strength wastes.

The periodic disposal of cleaners and spent chromate and phosphate solutions could pose corrosion problems or otherwise interfere with the operation of the municipal sewage system. In this respect then, retaining and treating these high-strength intermittent discharges is recommended.

FORD MOTOR COMPANY OF CANADA LIMITED

Ford Motor Company of Canada Limited operates an automotive parts complex at 2780 Riverside Drive East in Windsor.

In 1960, the initial industrial waste survey at the Ford Windsor Plant was conducted by staff of the OWRC. At the time the plant products were confined to automotive engines, wheels, drive shafts and an assortment of small automotive components. The quality of the effluent, with the exception of a high suspended solids content, was satisfactory for discharge to a watercourse. This flow was rated at about six million gallons per day and was discharged to the Detroit River.

The plant was again surveyed in March, 1966, and at that time operations in the plant had been expanded to include chassis, axles and transmission manufacturing. The results of the 1966 survey indicated this plant discharged to the Detroit River approximately 47 million gallons per day of waste which contained concentrations of suspended solids, ether solubles and phenols in excess of the OWRC objectives for discharge to a watercourse.

Since this last OWRC survey, the Company has completed a programme designed to first identify the sources of waste and then develop plans for treating them. These plans were recently approved by the OWRC and installation of facilities is to be completed by September 1970.

The Ford Windsor Plant was not visited as part of the industrial waste survey in the City of Windsor in 1968; however, information and data obtained during previous visits and surveys at this plant will be used for the purposes of this report.

Personnel Interviewed

Mr. M. Ritchie	-	Manager, Transmission and Chassis Plant

Operating Data

Operating Schedule	-	8 to 16 hours/day
		5 days/week
Employees	-	5,500 (approximately)

Description of Plant Processes

The Windsor manufacturing operations of Ford consist of five main plants. These are:

Plant #1	-	Office and Warehouse
Plant #2	-	Transmission and Chassis Plant
Plant #3	-	Powerhouse
Plant #5	-	Foundry
Plant #6	-	Engine Plant

Engine blocks, heads, crank shafts, camshafts and drums for use in other plants are cast in Plant #5. The production of these parts involve casting, heat treating and washing.

Plant #2 produces rear axles, transmission and miscellaneous parts. This is accomplished by machining of rough castings, blanks, and other rough parts and assembly of completed parts, stamping and stamping assembly. Other related operations may include chemical treating, heat treating, cleaning and painting of the different parts or finished products.

The only other area of significant manufacturing operations is Plant #6. The manufacture of engines (mostly V-8) is accomplished by the machining of rough castings such as block, heads, crankshafts and other internal parts, followed by the assembly of these parts, into the final engine. The engines are painted, tested, balanced and adjusted before shipping to automotive assembly plants.

Water Supply and Distribution

Source - Municipal Supply and Detroit River

Volume

Detroit River - 56.4 mgd

City of Windsor (average over 1967) - 275,000 gpd

Estimated Distribution

Detroit River Supply:

Plant #1	-	0.4 mgd
Plant #2	-	2.1 "
Plant #3	-	40.3 "
Plant #5	-	10.8 "
Plant #6	-	1.4 "
Compressor	-	1.4 "
		56.4 mgd

Estimated Distribution cont'd

Municipal Supply:

Sanitary Usage	120,000 gpd
Other Uses (boilers etc.)	155,000 gpd
	275,000 gpd

Sources of Liquid Wastes and Disposal

The majority of liquid wastes originate in the transmission and chassis plant (Plant #2), powerhouse (Plant #3), foundry (Plant #5) and the engine plant (Plant #6). All the process wastes from these plants are discharged to a main sewer and thence to the Detroit River.

The main sources of wastes and the plants that they originate from are given as follows:

1. Coolants and cutting and machining oil dumps (Plants #2 and #6)
2. Cooling water (Plant #3)
3. Softener backwash and boiler blowdown (Plant #3)
4. Sand wash water and dust scrubbing water (Plant #5)
5. Paint booth dumps and detergent wash waters (Plant #6)
6. Chemical dumps (Plants #2 and #6)

Sampling and Analysis

The composite sample of the combined plant outfall taken at the Ford Windsor automotive complex on March 10, 1966, by OWRC personnel showed the following concentrations:

Sample Point	Solids		pH	Ether Solubles	Phenol (ppb)
	Total	Susp.			
Outfall to Detroit River	258	86	8.1	15	40

All analyses except pH reported in parts per million

In addition, the Company's consultant sampling programme showed an average iron content of 5 ppm in the effluent to the Detroit River.

WASTE LOADINGS

The loadings of contaminants to the Detroit River calculated using a waste flow of 56.4 mgd are:

Suspended Solids	- 48,500 lbs/day
Ether Solubles	- 8,500 lbs/day
Phenols	- 22 lbs/day
Iron	- 2,800 lbs/day
pH	- 8.1

CONCLUSIONS AND RECOMMENDATIONS

The 1966 report on the industrial waste survey at the Ford Windsor automotive complex concluded that the plant wastes exhibited concentrations of phenols and suspended solids that were in excess of OWRC recommended objectives. The sources of these contaminants were traced back to the Foundry, Transmission and Chassis Plant and the Engine Plant. These facts were later substantiated by results of samples taken during a survey of this plant by the Company's consultants and the appropriate waste treatment facilities have been designed and are being installed.

GENERAL MOTORS TRIM LIMITED

General Motors Trim Limited is located at 1964 Lauzon Road. Interior trim products from this plant are used on passenger cars built both for the domestic and export markets.

DETAILS OF SURVEY

This plant was visited on April 2, 1968 and samples of the various contaminated flows obtained on April 3 and 4, 1968.

Personnel Interviewed

Mr. D. K. Campbell - Chief Stationary Engineer

Description of Plant Processes

General Motors Trim Limited is essentially a "cut and sew" plant as it produces interior trim for use in passenger cars.

Roll goods are received by rail and stored in material storage areas. The material is either die cut by machines or table cut by hand as needed. Parts like door panels are die cut and then pattern embossed in dielectric presses. Some materials receive glue application on a rollcoat adhesive machine so that they can be glued to cardboard backings. Adhesive is used in the manufacture of arm rests, door pads, and door quarters.

Other die cut and hand cut materials are sent to the seat cushion and seat back sewing area. All parts are machine sewed. A smaller area in the plant handles windhose, sunshade, and headlining sewing. Finished parts are packaged and stored for shipment to assembly plants.

Operating Data

Employees - 1,700 (approximately)

Operating Schedule - 16 hours/day

Water Supply and Distribution

Source - Windsor Utilities Commission

Volume - 135,000 gpd (approximately)

Distribution

Boiler make-up and condensate cooling	6,800 gpd
Air Compressor cooling water make-up	2,200 gpd
Water Softener	900 gpd
Dielectric presses cooling water	54,500 gpd
Lab. air conditioning cooling water	9,800 gpd
IBM air conditioning cooling water	3,000 gpd
Degreaser	6,000 gpd
Rollcoaters	5,000 gpd
Sanitary and Domestic	46,400 gpd
Other Uses	400 gpd
	135,000 gpd

Sources and Disposal of Liquid Wastes

Wastes Entering Plant Storm Sewers:

All cooling water, boiler condensate, air compressor and water softener blowdown enter the plant storm sewer which drains to the Little River.

Air compressor cooling water is recirculated and continuously treated with chromate as a rust preventive. There is a continuous bleed-off of the cooling water to the sewers. This is estimated to be approximately one gallon every 4 to 5 minutes. Due to substantial amounts of oil in this compressor blowdown, it was reported that the Company is planning to install an oil separator.

Boiler condensate is maintained below 130°F prior to discharge to the storm sewer. The temperature is automatically controlled by addition of cold city water.

The water softener is backwashed once every week.

Cooling water through the air-conditioning equipment and the dielectric presses is used on a once-through basis. The Company anticipates the installation of cooling towers and refrigeration equipment to cool these waters sufficiently for reuse on the dielectric presses.

Floor drainage to a sump in the truck receiving area also enters the storm sewers. It was indicated that changes will be made in the future to pump this waste to the sump by the degreaser where it can enter the sanitary sewer.

Wastes Entering the Sanitary Sewer:

The Company operates a 3-stage degreaser-washer for removal of an oily film on small metal parts. The continuous wastes from stage 3 of this unit together with occasional overflows from the first and second stages, are directed to a common sump before entering the sewer.

Two rollcoater machines are employed for the application of a water soluble synthetic rubber latex adhesive to door cover foundations. These machines produce a continuous waste stream which passes through a drain board

beneath each machine and enters a 300 gallon baffled settling pit for removal of suspended solids.

Other Wastes:

At the end of each shift the rollcoater machines are washed free of all adhesive and the wastes are put into drums. Periodically the settling tank handling the above wastes, is cleaned and the solids are removed in drums, by a waste disposal contractor.

Sampling and Analysis

Grab samples were taken of the following:

1. Wastes in sump by degreasing unit.
2. Rollcoater machine waste effluent from the settling tank.
3. Storm sewer effluent to the Little River at plant outfall.

The analytical results were as follows:

Sample Number	Volume (gpd)	BOD_5	Solids		Ether Solubles	Total Chrom.	COD.	Phenols	pH
			Total	Susp.					
1	6,000	190	5,180	175	350	-	2,000	50	6.5
2	5,000	114	216	18	-		125	-	9.0
3	77,200	0.5	340	5	-	0.12	8	-	7.3

WASTE LOADINGS

Based on estimated flows and the analytical results, the waste loadings from this plant to the sanitary sewer are:

BOD_5	- 18 lbs/day
Suspended Solids	- 12 lbs/day
COD	- 120 lbs/day
Ether Solubles	- 20 lbs/day

DISCUSSION OF FINDINGS

The waste flows from this plant to the sanitary and storm sewers, as indicated by the analytical results, in most cases meet both the requirements of the City of Windsor Sewer-Use By-Law, and the OWRC objectives. One exception to this, however, is the ether soluble content of the wastes from the degreasing unit. This concentration of 350 ppm would exceed the prescribed By-Law limit of 15 ppm even after dilution with other wastes discharging to the municipal sanitary sewer system from the plant. This oil content probably exists in the emulsified state so that treatment for removal will entail some chemical treatment.

CONCLUSIONS AND RECOMMENDATIONS

In general, the wastes from this plant to the sanitary and storm sewers meet both the City of Windsor By-Law requirements and the OWRC objectives. However, the ether soluble concentration in the discharge to the municipal sanitary system did exceed the By-Law limit of 15 ppm and corrective action should be taken.

McKINNON INDUSTRIES LIMITED

The Windsor plant of McKinnon Industries Limited is located at 1487 Walker Road and is engaged in the manufacture of automotive transmissions.

On May 8, 1968, this plant was visited as part of the over-all survey of the industries in Windsor. It was discovered, from discussions with plant personnel, that the Company was in the process of constructing waste treatment facilities for the collection and treatment of industrial waste to comply with limits set out in the proposed City of Windsor Sewer-Use By-Law.

At the time of this visit the acquisition of a representative sample of the industrial waste effluent was considered to be virtually impossible since several waste flows were being segregated and diverted. Therefore, information supplied by the plant personnel on the estimated volume and strength of the final effluent are used for the purposes of this report.

However, a more recent survey conducted in late November, 1968, revealed that the treatment facilities proposed in the May, 1968 municipal survey had been completed and put on stream. Based on the analytical results of several samples taken during this extensive survey the reduction of both ether soluble and suspended solids concentrations in the final effluent was in excess of 90%. Plant wastes being discharged to the municipal sewage system at that time were within the By-Law objectives.

Personnel Interviewed

Mr. D. A. Elcombe - Plant Engineer

Mr. J. McNaughton - Senior Mechanical Draughtsman

Description of Plant Processes

The main operations in this plant are the machining and heat treating of blank metal parts, stamped or cast elsewhere, and the final assembly and testing of the automotive transmissions. Several intermediate operations such as anodizing, impregnating, deburring and washing of the metal parts are also carried out.

Production and Operating Data

Number of Employees	- 1,100
Operating	- 1 to 3 shifts/day 5 days/week
Raw Materials	- Blank metal parts, coolants and detergents
Production	- Approximately 2,000 units/day

Water Supply and Distribution

Source	- Municipal Supply
Volume (January 1968)	- 350,000 gpd
Distribution	
Domestic and Sanitary	25,000 gpd
Cooling	250,000 gpd
Washing	65,000 gpd
Other Uses (boilerhouse etc.)	10,000 gpd
	350,000 gpd

Sources of Liquid Wastes, Treatment and Disposal

Wastes arise in this plant from the following sources:

1. Dumps of cutting and machining oils, coolants, washing machine detergents, and other chemicals from the anodizing and impregnating areas.
2. Water utilized for washing off oil adhering to parts.
3. Water used to cool the quench oil in heat treatment.
4. Boiler blowdown and softener backwash.
5. Sanitary sewage.

In May, 1968 these wastes were discharged, with the exception of land dumping of some coolants, to a combined sewer on Walker Road.

According to Company estimates, about 65,000 to 100,000 gallons per day of process or contaminated wastes containing an ether soluble content as high as 20,000 ppm emanated from the McKinnon Industries Windsor Plant. On this basis, waste treatment facilities consisting of holding tanks, emulsion breaking tank, air floatation, pH adjustment and final clarification, were designed and have since been installed.

CONCLUSIONS AND RECOMMENDATIONS

In May, 1968 the wastes from this plant were unsatisfactory for discharge to any storm or sanitary sewer system. An estimate of the concentrations of contaminants in the final waste effluent from this plant at that time was:

BOD_5	-	250 ppm
Suspended Solids	-	300 ppm
Ether Solubles	-	200 ppm

However, a more recent survey conducted in late November, 1968, revealed that the treatment facilities proposed in the May, 1968 municipal survey had been completed and put on stream. Based on the analytical results of several samples taken during this extensive survey the reduction of both ether soluble and suspended solids concentrations in the final effluent was in excess of 90%. Plant wastes being discharged to the municipal sewage system at that time were well within the By-Law objectives.

BENDIX-ECLIPSE OF CANADA LIMITED

Bendix-Eclipse of Canada Limited manufactures heavy duty precision mechanisms for the automotive industry. Parts such as Bendix drives, brake master cylinders, pistons and brake shoes are manufactured and finished at both the Argyle and Prince Road Plants.

DETAILS OF SURVEY

The Argyle Street plant was visited on March 21, 1968 and the Prince Road plant on March 22, 1968.

Personnel Interviewed

Mr. J. Kennedy - Plant Manager (Argyle Street Plant)

Mr. B. Hewitt - Plant Manager (Prince Road Plant)

Mr. J. Parent - Plating Supervisor (Argyle Street Plant)

Description of Plant Processes

This industry is basically a tool and die shop operation. Crude castings are brought to the factory where they are washed, ground, welded and finished into the automobile or truck parts. Some parts require a final protective surface coating of zinc, copper or cadmium. Others are phosphatized and/or painted. A more detailed description of the different operations is as follows:

Machining Department: Three parts washers are used in the Argyle Street plant to degrease incoming crude castings before any actual machining is performed. In addition to grinding and associated machine operations, this department also has four welding lines that operate 24 hours per day. The

Prince Road plant is primarily a machining operation with one accompanying parts washer.

Finishing Department: After machining some parts are given surface finishes at the Argyle Road plant as follows:

Master Cylinders and Associated Parts	-	zinc plated
Bendix Drives	-	copper plated, hardened copper strip and copper plated again
Brake Shoes	-	degreased, phosphated, rinsed.

The plating operations are carried out using conventional chemical baths and plating techniques. A small number of specialty parts are cadmium plated while a few other articles are spray painted. These, however, constitute a very small portion of the plating department's total output.

Operating Data

Operating Schedule	-	8 hrs/day	
		5 days/week	
Number of Employees	-	approximately 700	

Water Supply and Distribution

Source	-	P.U.C.	
Volume (Average over 1967)	-	Prince Road Plant	60,000 gpd
	-	Argyle Road Plant	200,000 gpd

Distribution*

Argyle Road Plant

Domestic Wastes	15,000 gpd
Plating	15,000 gpd

* Estimated

Argyle Road Plant (cont'd)

Welding Water	10,000 gpd
Cooling Water (boiler, compressor etc.)	135,000 gpd
Washer Water	12,000 gpd
Other Uses	13,000 gpd
	200,000 gpd

Prince Road Plant

Domestic Wastes	1,000 gpd
Wash Waters	4,000 gpd
Cooling (compressors etc.)	50,000 gpd
Other Uses	5,000 gpd
	60,000 gpd

Sources of Liquid Wastes and Disposal

Of the three main waste discharges at the Argyle Street plant two are continuous. The other is the periodic dumping of caustic cleaners as per the following schedule:

Volume	Frequency of Dumping
1,600 gals.	1 every 3 months
370 gals.	2 every month
370 gals.	2 every month

These solutions are bled to the sewers to achieve maximum dilution.

One of the continuous flows consists of cooling water from the welding machine tips that passes once through these units and is discharged to the sewers.

The other is made up of rinses from the electroplating area. These are the most highly contaminated wastes and are discharged untreated along with the cooling waters to the combined sewers on Argyle Street.

Wastes from the Prince Road plant consist of intermittent wash waters from the washing operation and periodic batch dumps of the cleaning solution.

Sampling and Analysis

Grab samples were obtained of the rinses following the zinc and copper plating cycles, the phosphatizing cycle, and the copper stripping cycle in the Argyle Street plant. A grab sample was also obtained of the total plating area effluent while all above operations were underway.

The analytical results of these samples are as follows:

Sample Number	Solids		pH	Zinc as Zn	Copper as Cu	Cyanide as HCN	Phosphates as PO_4
	Total	Susp.					
1	290	10	9.6	40.6	-	12	-
2	188	2	7.9	-	4.17	2.4	-
3	214	34	7.5	-	-	-	36
4	856	9	2.5	.5	8.8	.02	-
5	490	121	5.5	1.3	23.2	4.4	8.7

Sample Description

1. - Rinse after Zinc Plating Cycle
2. - Rinse after Copper Plating Cycle
3. - Rinse after Phosphatizing
4. - Rinse after Copper Strip
5. - Combined Plating Effluent to Combined Sewer

DISCUSSION OF RESULTS

The analytical results of the samples showed concentrations of cyanides and copper from the Argyle Street plant in excess of the limits set out in the City of Windsor Sewer-Use By-Law. These excessive concentrations can be traced back to the rinses immediately following the zinc and copper electroplating operations.

Conventional treatment methods for this type of waste usually involve alkaline chlorination to destroy the cyanide, followed by neutralization and settling or filtration to remove the metal constituents. Because these wastes are of relatively small volume, batch treatment preceeded by in-plant control measures may be the best method of meeting by-law limits.

No samples were taken of the other in-plant flows, but it is expected that the flows from the parts washers and other machining equipment would exhibit high BOD_5 and ether solubles concentrations. These concentrations, however, are not expected to exceed the City By-Law Limits.

Batch dumps of the chemical and plating baths, coolants, and machining oils from both plants should be controlled since they could contribute significantly to the total waste loadings from this plant. It is not known whether these intermittent batch discharges are treated before entry into the sewers; however, in the case of the electroplating solutions, these tanks should be chemically treated and clarified if discharged to the sewers, or if possible the treated chemical baths should be trucked away, along with any cooling or machining oils, for suitable disposal.

CONCLUSIONS AND RECOMMENDATIONS

The quality of the electroplating wastes from the Argyle Street plant was found to be unacceptable for discharge to the municipal sanitary sewer system. The Company should explore methods of reducing these concentrations by in-plant control measures followed by treatment to render the plant wastes acceptable for discharge to the sanitary sewers.

The intermittent discharges of chemical and electroplating solutions, coolants, and machining oils would significantly increase the waste loadings from the two plants. It is therefore recommended that these discharges, be retained and treated before disposal.

CHRYSLER CANADA LIMITED - WINDSOR FOUNDRY

Chrysler Canada Limited operates a foundry on Walker Road which produces the engine components for the engine assemblying operations at the other Chrysler plant.

DETAILS OF SURVEY

This plant was visited on March 20, 1968.

Personnel Interviewed

Mr. B. Morse	-	Metallurgist
Mr. C. Bondy	-	Stationery Engineer

Description of Plant Processes

The operations in this plant are typical of a foundry. The molten metal is taken from the cupola and is poured into a sand casting. This is allowed to cool and, after cooling, the sand is removed in a shakeout operation.

Operating Data

Number of Employees	-	Approximately 600
Operating Schedule	-	16 hours/day
		5 days/week

Water Supply and Distribution

Source	-	Municipal Supply
Volume (average over 1967)	-	175,000 gpd

Distribution

Sanitary and Domestic	12,000 gpd
Cooling Waters	125,000 gpd
Moulding Sand	15,000 gpd
Other Uses (boiler etc.)	23,000
	175,000 gpd

Sources of Wastes and Their Disposal

The major portion of the total water supplied is used for cooling purposes in the cupola, the electric induction furnace, and other water-cooled machinery. Some water is also used to wet the moulding sand before the casting operations. All cooling waters are discharged to a storm sewer.

Sanitary and domestic wastes are discharged to a sanitary sewer on Walker Road.

It should be noted that there are no sand washing or wet vent gas scrubbing operations carried out at this plant.

REMARKS

The wastes from this operation should be acceptable for discharge to a storm sewer, providing they are not contaminated by spilled moulding sand and leaking hydraulic oil. Another point still left in doubt is the ultimate disposal of the moulding sand and hence it is recommended that this plant be re-inspected in the near future.

COLONIAL TOOL COMPANY LTD

Colonial Tool Company Ltd., is located at 1691 Walker Road and is one of the larger tool and die shops in Windsor.

DETAILS OF SURVEY

This plant was visited on March 19, 1968 and samples of the various waste flows obtained.

Personnel Interviewed

Mr. R. H. Strickland - Vice-President and General Manager

Description of Plant Operations

The main plant operations are machining, grinding and hardening of blank metal parts. The hardening operations consist of heat treating the parts in one of three furnaces. Each furnace is kept at a different temperature, to produce pre-determined strengths of metals.

Operating Data

Employees	- 110
Operating Schedule	- 9 hrs/day
	5 days/week

Water Supply and Distribution

Source	- Windsor Utilities Commission
Volume (average over 1967)	- 15,000 gpd

Distribution

Sanitary and Domestic	2,500 gpd
Industrial Cooling Water	12,500 gpd
	15,000 gpd

Sources and Disposal of Liquid Wastes

Normal waste waters from this plant are cooling water used in the transformer and furnace electrodes, and sanitary wastes. Periodic batch dumps of 500 gallons of water containing some tri-sodium phosphate and 200 gallons of water containing some soluble oil are also discharged to the sewers. These batch dumps invariably take place every week. These combined waste flows are directed to a combined sewer on Walker Road.

Sampling and Analytical Results

Grab samples of batch dumps and the continuous waste flow were obtained and the analytical results were as follows:

Sample Number	BOD_5	Solids		Ether Solubles	Phenols (ppb)	Phosphate as PO_4
		Total	Susp.			
1	10,600	-	-	855	250	-
2	165	1,514	83	31	6	600
3	1.3	170	1	-	-	-

All analyses, except phenols are reported in parts per million (ppm)

1. - Soluble Oil Solution
2. - Trisodium Phosphate Solution
3. - The Transformer and Furnace Electrode Cooling Water

CONCLUSIONS AND RECOMMENDATIONS

The normal plant effluent, which contains mainly cooling waters, is suitable for direct discharge to the combined sewer system. However, as in the case of any of the smaller tool and die shops, the intermittent discharge of coolants and cutting oils to the sewers is not acceptable. It is recommended that these dumps be contained in a tank for treatment prior to disposal.

DOSCO INDUSTRIES LIMITED

The Canadian Bridge Works Division of Dominion Steel and Coal Corporation Limited manufactures galvanized hydro towers and other structural steel components. The plant is located at 1219 Walker Road.

DETAILS OF SURVEY

This plant was visited and samples of the waste flows were taken on March 19, 1968.

Personnel Interviewed

Mr. M. Labute - Plant Engineer

Mr. P. Peralt - General Foreman

Description of Plant Processes

These operations can be essentially divided into two areas. In Plant No. 1, structural steel members are cut, formed, shot-blasted to remove rust, and finally spray painted, while at Plant No. 2, structural members are formed and galvanized on two identical lines.

Galvanizing is carried out in a seven-step operation. Steel members are cleaned in a caustic solution, dipped in an acid pickling solution and then rinsed in cold water. The members are immersed in a fluxing agent (zinc ammonium chloride) and then lowered into a molten zinc solution in an adjacent tank. This is followed by a final cold water running rinse.

Operating Data

Number of Employees - 700

Operating Schedule - 8 hours/day

5 days/week

Water Supply and Distribution

Source	-	Windsor Utilities Commission
Volume (average over 1967)	-	175,000 gpd
Estimated Distribution		
Office	-	6,000 gpd (sanitary usage)
Plant #1	-	26,000 gpd
Plant #2	-	143,000 gpd
		175,000 gpd

Sources of Liquid Wastes and Disposal

The only significant liquid wastes originate in Plant #2 from the galvanizing operations. These wastes are comprised of the three running rinses incorporated in the galvanizing line which are the rinse after the pickling, the rinse after fluxing, and the rinse after the galvanizing operation. The flows are continuous and total approximately 15,000 gallons per hours.

Periodically, the pickling acid tank (5,000 gallons) becomes spent and has to be dumped. The sludge from the tank is land disposed. The frequency of dumping is dependent somewhat upon the amount of work passing through the galvanizing line but, as a rule, it is dumped once every 2 weeks. At the time of this survey, the contents of the tank had been in use for almost 3 months.

The remainder of the wastes are comprised of water used for cooling purposes in Plant No. 1.

All wastes are discharged to the combined municipal sewer that crosses Walker Road at Ottawa Street.

Sampling and Analysis

Grab samples were obtained of each rinse following the pickling and galvanizing operations. A grab sample of pickling bath was also obtained. Results of analyses are as follows:

Sample Number	Solids		pH	Iron as Fe	Zinc as Zn	Lead as Pb
	Total	Susp.				
1	812	2	3.1	9.6	-	1.4
2	190	2	6.6	.7	.17	2.8
3	-	140	.4	5.9	16,700	5.8

Sample Description

1. - Rinse after Pickling
2. - Rinse after Galvanizing
3. - Acid Dip

DISCUSSION OF RESULTS

Except for an acidic condition of the steel pickling rinse water, both running rinses following the pickling and galvanizing operations appear to be acceptable for discharge to the municipal sewage treatment system.

Analysis of the acid dip tank contents revealed an extremely high concentration of zinc. There was no apparent reason for this high level and since the iron concentration was very low it is suggested that the analytical results may have been unknowingly interchanged.

CONCLUSIONS AND RECOMMENDATIONS

The only significant liquid wastes from Canadian Bridge Company results from galvinizing operation in Plant #2. The running rinses appear to

be of satisfactory quality for discharge to the municipal sewage system, except for an acidic condition of the pickling rinse.

It is recommended that the rinse waters, originating after pickling operations, be segregated for treatment prior to disposal. Steps should be taken to provide neutralization to adjust the pH and to remove the resulting sludge before discharge to the municipal sewers. The spent pickling liquors should at no time be discharged to the sewers without prior pre-treatment to render them acceptable. It is also recommended that another sample of spent pickle liquor be analysed to determine its zinc and iron content.

KELSEY-HAYES CANADA LTD

This plant is located at 309 Ellis Street East and is engaged in the manufacture of wheel rims and other small miscellaneous parts for automobile and truck assembly.

DETAILS OF SURVEY

This plant was visited on April 3, 1968 and again on April 4, 1968 when samples of the various plant effluents were obtained.

Plant Personnel

Mr. J. Matheson - Plant Engineer

Mr. K. Lewis - Engineering Department

Description of Plant Processes

The first step in the manufacture of wheel rims is the cleaning of the raw steel sheets. This is accomplished by first shot-blasting the sheet metal, followed by pickling in 20% sulphuric acid and immersion in a chromate bath. The clean metal is cut and shaped into two assemblies, the rim of the wheel and the spider assembly. The two components are combined by welding into an assembled wheel. The wheel is then bonderized, to prevent rusting, in a five-stage unit and painted. The finished wheel is then ready for use.

The forming and shaping operations are carried out in four new integrated wheel assembly lines and three old lines, while bonderizing is done in three separate units. An adjacent zinc electroplating line is utilized for the protective plating of truck rims before assembly.

Other small automotive wheel parts are presently manufactured at this plant, but it was reported that by the end of 1968, the operations in this plant would be confined mainly to the manufacture of wheel rims.

Operating Data

Number of Employees	- 450
Operating Schedule	- 16 hours/day

Water Supply and Distribution

Source	- Municipal supply
Volume (average over 1967)	- 350,000 gpd

Estimated Distribution

Sanitary and Domestic	10,000 gpd
Plating	20,000 gpd
Pickling	75,000 gpd
Compressors and Coolers	60,000 gpd
Bonderizing	75,000 gpd
Detergent Wash	100,000 gpd
Other Uses (boiler etc.)	10,000 gpd
	350,000 gpd

Sources and Disposal of Wastes

The sources of wastes were as follows:

1. Rinses and dumps from the electroplating line.
2. Rinses and dumps from three bonderizing lines.
3. Rinses and dumps from the pickling line.
4. Rinses after detergent cleaning in rim manufacture.
5. Cooling water from coolers and compressors.

6. Boiler blowdown and softener backwashes.

7. Sanitary sewage.

The type, volume and frequency of the periodic dumps can be summarized in the following table:

WASTE	VOLUME IN GALLONS	FREQUENCY OF DISCHARGE
Neutralized Pickling Acid	4,000	Once per month
Zinc Plating Solution	2,500	Once every three months
Zinc Phosphate Solution (3)	8,000	Once every three months
Chromic Acid Solution (3)	2,500	Once every three months
Acid Cleaner in Plating Line	1,000	Once every two months
Alkali Cleaner in Plating Line	1,000	Once every two months
Coolants	-	Not known
Detergent Wash Solution	500	Once every two weeks
Soluble Oil Dumps	-	Not known

At least three of the above chemical tanks - zinc phosphating, the caustic wash, and the chromic acid solution - are overflowed continuously at a constant rate to the sewer system.

The waste flows from the different sections in this plant are combined in a common sump and discharged to the combined sewer on Mercer Street.

Sanitary wastes are also discharged to this sewer.

Waste Treatment

Spent pickle liquor is transferred to a holding tank and neutralized with a lime slurry before discharge to the sewers.

The zinc plating solution is neutralized before dumping to the sewer system.

Sampling and Analysis

Grab samples were taken at all the significant sources of wastes from this plant.

The analytical results of these samples are:

Sample Number	BOD_5	Solids		Chrome		Cyanide as HCN	pH at Lab.	Zinc as Zn	Ether Solubles
		Total	Susp.	Total	Hexa				
1	-	298	20	-	-	33	11.0	1	-
2	-	566	55	-	-	-	8.1	5.3	-
3	-	-	-	170	165	-	4.5	-	-
4	385	1,240	276	-	-	-	6.8	-	527
5	1,150	11,966	856	-	-	-	6.4	-	1,893

Note: All analyses except pH reported in parts per million

Sample Description

1. - Rinse after Zinc Plate
2. - Rinse after Zinc Phosphate
3. - Chromic Acid Overflow
4. - Rinse after Detergent Wash
5. - Spider Part Wash

WASTE LOADINGS

Based on estimated flows and the analytical results, the calculated waste loadings from this plant are:

Waste	Flow gpd*	Chromium lbs/day	BOD_5 lbs/day	Ether Solubles lbs/day	Zinc lbs/day	Sus. Solids lbs/day
Detergent Wash	100,000	-	385	527	-	276
Chromic Acid Overflow	13,000	22	-	-	-	-
Spider Wash	3,500	-	40	22	-	30
Bonderite Line (excluding chromic acid flow)	75,000	-	-	-	5	34
Total		22	425	549	5	340

* Based on a 16-hour day

The loadings from the plating line, which operates an average of 4 hours per day, 3 days per week and which discharges about 20 gpm of a contaminated waste, were not included in the total above because the plating line was not operating at the time of the visit and thus a representative sample could not be obtained.

DISCUSSION

The significant sources of wastes, and not the final effluent, were sampled at the time of this visit. This was necessitated because of the inaccessability of the final outfall at the sanitary sewer system.

The analyses of these individual samples reveal that there is some cause for concern regarding several of these waste flows. First, the rinse following the detergent wash of the rims showed high concentrations of ether solubles. Since this source of waste is the largest in volume, dilution with other wastes would not significantly reduce this concentration to meet the requirements of the Windsor Industrial Waste By-Law. Similarly, the overflow from the chromic acid tank in the bonderite unit showed a high concentration of chromium. Since there are three such units with a total flow of about 15 gpm dilution in about 350 gpm of other wastes is not likely to reduce the chromium concentration (170 ppm) to the prescribed limit of 3 ppm.

Of greater concern, however, are the occasional dumps of the various high strength chemical tanks to the sewers. All of these dumps would contain high concentrations of contaminants which would render them unsuitable for discharge into the sewer.

For instance, the chromic acid dumps give rise to a large slug of hexavalent chromium which is extremely toxic to the micro-organisms essential to biological processes at a sewage treatment plant. The City of Windsor Sewer-Use By-Law stipulates that a waste containing no more than 3 ppm of total chromium can be discharged to the sanitary sewer.

In like manner, the plating baths, cleaning solutions and the alkaline zinc phosphate solution, will contain excessive concentrations of cyanides, zinc, phosphates and exhibit a very high or very low pH depending on which solution is involved. These intermittent waste discharges should be controlled.

The plating rinse following the zinc plate would undoubtedly contain high levels of cyanides and would require treatment.

Control of these types of wastes usually involves a three stage operation as outlined below:

(a) Collection and treatment of the chromium-contaminated wastes. Normally treatment employs some form of reduction to convert the hexavalent chromium ion to the trivalent state.

(b) Collection and alkaline chlorination of cyanide-bearing wastes.

(c) Collection, de-emulsification and oil separation of the oil-contaminated wastes.

(d) As a final step, the wastes are neutralized and clarified to remove the insoluble metal hydroxides and other settleable or floatable materials.

CONCLUSIONS AND RECOMMENDATIONS

The analytical results of samples collected within the plant revealed that concentrations of chromium and ether solubles would likely render the effluent from this plant unsuitable for discharge to a sanitary sewer. Moreover, the batch dumps of spent chemicals (alkalis, detergents, coolants, acids, etc.) to the sewer would result in conditions which would be in violation of the Windsor Sewer-Use By-Law and thus control of such dumps is imperative.

The waste loadings from this plant are calculated to be 425 lbs/day BOD_5, 549 lbs/day ether solubles and 22 lbs/day total chromium.

It is therefore recommended that the Company initiate a study of its operations to determine in more detail the sources and characteristics of its wastes.

Based on the results of this study, a programme should be established which will lead to the installation of treatment and control facilities necessary to meet the requirements of the City of Windsor Sewer-Use By-Law.

LEEPO MACHINE PRODUCTS LTD

This plant, is located at 1701 Shepherd Street. The main products fabricated at this plant are power tools and lawn mowers.

DETAILS OF SURVEY

This plant was visited on March 19, 1968 and samples of the various waste flows taken.

Personnel Interviewed

Mr. J. Crosby	-	Office Manager
Mr. I. C. Dickson	-	Plant Engineer
Mr. Ross McKaig	-	Plant Superintendent

Plant Processes

The plant operation consists mainly of a power lawn mower assembly line. Power tools, tillers, and utility trailers are also produced.

All lawn mower parts are obtained from outside sources, assembled, and packaged for shipment. The lawn mower blade covers and several other small parts are painted before assembling. Prior to painting operation, these parts receive a hot phosphate wash (170° F) called "Metacoat 416" in one of two washers used for handling large and small parts. Large parts are washed and rinsed while the small parts are only washed. Both wash and rinse waters are recirculated through the machinery with make-up water added daily.

Operating Data

Number of Employees	-	approximately 100
Operation Schedule	-	8 hours/day
		5 days/week

Water Supply and Distribution

Source	-	Windsor Utilities Commission
Volume (average over 1967)	-	5,500 gpd
Distribution		
Sanitary and Domestic		2,000 gpd
Make-up on Wash and Rinse Waters		2,900 gpd
Other		600 gpd
		5,500 gpd

Sources of Wastes and Disposal

Industrial wastes originate from periodic dumpings of the washing and rinsing tanks and the paint spray booth.

Each year, during the summer, all tanks in the washers are cleaned of oils and sludges, and the wash waters are dumped to the sewer. Approximately 3,000 gallons of this waste would be dumped.

The waters from the four paint spray booths (400 gallons each) are dumped once per month.

Industrial and sanitary wastes are directed to the combined sewer on Shepherd Street.

Sampling and Analysis

On the afternoon of March 19, 1968 grab samples were taken of the hot wash water and rinse from the large parts washer.

A sample was also taken from one paint spray booth which was considered to be representative of the 4 spray booths in this plant.

The analytical results of the samples were:

Sample Number	BOD_5	Solids		Phenols (ppb)	pH	Ether Solubles
		Total	Susp.			
1	2,800	3,364	68	240	8.7	123
2	-	-	-	32	6.0	1,031
3	-	17,396	328	24	5.5	170

All analyses, except pH and phenols are in parts per million

Sample Description

1. - Paint Spray Booth Contents
2. - Hot Water Wash
3. - Rinse Waters.

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

The ether soluble concentration of the continuous wastes from this plant is high for a direct discharge to a combined sewer. The City of Windsor Sewer-Use By-Law requirements for ether soluble content is 15 ppm. However, in view of the relatively small volume of this waste flow, no detrimental effects are anticipated.

The batch dumps of four paint spray booths and detergent wash waters will add to the loading to the sewers and, as a result, should be collected for skimming and neutralization before bleeding off to the sewers over an extended period of time.

NATIONAL AUTO RADIATOR MFG. COMPANY LTD

This plant is located at 2575 Airport Road and is engaged in stamping and assembling of gas tanks, oil pans, and cylinder head covers for the automotive and agricultural equipment industries.

DETAILS OF SURVEY

This plant was visited on January 24, 1968 and grab samples of various waste streams were taken.

Personnel Interviewed

Mr. S. Fancy - Plant Engineer

Description of Plant Processes

The operations carried out in this plant are essentially stamping, assembling and cleaning.

The sheet metal is first coated with a layer of oil in a roller-type machine, then stamped to the desired shape and form. The individual parts are then spot welded together to give the product. As a final operation the products are passed through one of four washers to remove the adhering oil on the metal surfaces.

Operating Data

Number of Employees - approximately 300

Operating Schedule - 16 hours/day
5 days/week

Water Supply and Distribution

Source	-	Municipal Supply
Volume (average over 1967)	-	56,000 gpd

Distribution

Sanitary and Domestic	12,000 gpd
Spot Welder Waters	5,000 gpd
Wash Waters	10,000 gpd
Compressor Waters	28,000 gpd
Other Uses	1,000 gpd
	56,000 gpd

Sources of Liquid Wastes and Disposal

The major source of contaminated wastes is the four washing machines. These wastes are collected along with cooling waters from the spot welders and compressors in a trench collection system and are directed to the storm sewer on Airport Road and ultimately reach the Grand Marais Drain. (Since the time of the survey, the Company has installed and is operating facilities to treat wastes from the washing machines before discharge).

Sanitary wastes are discharged to a septic tank and tile bed system.

Sampling

Grab samples of the final effluent to the storm sewers were collected, as well as the waste flow from one section of the plant.

Analytical Results

Sample Number	BOD_5	Solids		pH	Phenols (ppb)	Ether Solubles	Soluble BOD
		Total	Susp.				
1	220	1,914	1,570	6.6	25	743	68
2	395	1,220	692	6.7	60	1,146	168

All analyses except pH and phenols reported in parts per million

Sample Description

1. - Washer #1 wastewater plus cooling water.

2. - Final effluent to storm sewers

WASTE LOADINGS

The waste loadings from this plant were calculated using the results of the final effluent and combined flow of 44,000 gpd. These were:

BOD_5	- 175 lbs/day
Suspended Solids	- 305 lbs/day
Ether Solubles	- 500 lbs/day
Phenols	- < 1 lb/day
pH	- 6.7

DISCUSSION OF RESULTS

The analytical results of the final effluent sample revealed that BOD_5, suspended solids, phenols and ether solubles concentrations were far in excess of the OWRC objectives, and the City of Windsor Sewer-Use By-Law limits for a direct discharge to a storm sewer. Since these wastes eventually discharge into the Grand Marais Drain corrective action must be taken. (This has since been done).

REMARKS

The Company personnel have indicated that plans are underway to install collection and treatment facilities to de-emulsify, neutralize and clarify these wastes before allowing them to enter the sewer. On the completion of these facilities an extensive survey will be undertaken by OWRC staff to ensure that maximum treatment is being achieved. (These facilities have been installed and are now being evaluated).

ACME CHROME (WINDSOR) LIMITED

Acme Chrome (Windsor) Limited is located at 1165 Wescott Street and is engaged in the electroplating of small automotive metal parts stamped elsewhere.

DETAILS OF SURVEY

This plant was visited on February 19, 1968 and samples of the various waste flows were taken.

Personnel Interviewed

Mr. L. Schallenberger - President and Plant Manager

Description of Plant Processes

The metal parts are cleaned in alkaline and acid baths and rinsed prior to the application of protective and decorative metal coats in a conventional hoist copper-nickel-chrome electroplating line.

Operating Data

Employees	- 10
Operating Schedule	- 8 hours/day
	5 days/week

Water Supply and Distribution

All water is purchased from the Windsor Utilities Commission. The average daily consumption varied from 12,000 to 14,000 gallons per day (1967 figures)

Distribution

Domestic	200 gpd
Plating Operations	13,000 gpd
Other Uses	300 gpd
	13,500 gpd

Sources and Disposal of Liquid Wastes

Industrial wastes originate from a total of ten running rinses following the cleaning, dipping and electroplating operations. Other wastes arise from periodic dumpings of spent acid and alkaline cleaning solutions, electroplating solutions, filter backwash and general floor clean-up. All wastes enter a common sump before being discharged to the City's combined sewer system on Westcott Road.

Domestic wastes are discharged directly to the combined sewer.

Sampling and Analysis

A composite sample of the influent to the sump was taken by combining equal aliquots obtained at 15 minute intervals from 11.00 a.m. to 12.00 noon on February 19, 1968. Grab samples were also taken of the running rinses following copper, nickel and chrome electroplating operations. The analytical results were as follows:

Sample Number	Solids		pH	Nickel as Ni	Copper as Cu	Cyanide as HCN	Chromium	
	Total	Susp.					Total	Hexa
1	530	13	6.4	12.0	10.4	4.2	45.0	40.0
2	662	3	2.7	3.1	12.9	0.06	250	240
3	694	2	9.2	0.05	26.2	19.0	-	-
4	760	2	2.6	116.0	0.02	0.02	-	-

All analyses except pH reported in parts per million

Sample Description

1. - Influent to Sump
2. - Rinse after Chrome Plating
3. - Rinse after Copper Plating
4. - Rinse after Nickel Plating

WASTE LOADINGS

These are:

Nickel	- 1.6 lbs/day
Copper	- 1.3 lbs/day
Cyanide	- 0.5 lbs/day
Total Chromium	- 5.9 lbs/day

DISCUSSION OF FINDINGS

At the time of the visit the plant was considered to be operating under normal operating conditions.

Since there were no drag-out tanks after the respective plating operations, the rinse waters were high in metal concentrations as demonstrated by the analytical results. Although some dilution was obtained from other non-metallic contaminated running rinses, the final effluent exhibited concentrations of copper, nickel, chromium and cyanide in excess of the requirements of the City of Windsor Industrial Sewer-Use By-Law.

Treatment of this type of waste is usually accomplished by first implementing complete waste segregation followed by chemical treatment for the oxidation of cyanides, reduction of hexavalent chromium to the trivalent state and finally pH adjustment and removal of the precipitated metal hydroxides. Strict in-plant control measures along with drag out tanks are usually required to reduce the concentrations of the toxic ions in the wastes requiring treatment.

The batch dumps of alkaline and acid cleaners as well as the back-washings of nickel and copper filters must also be contained and treated before discharge to the sewers as they would represent conditions of extreme contamination. The cleaners could be blended together to attain a neutral pH

condition whereas the backwash from the filters could be collected and allowed to settle in drums. The supernatant from these drums could be returned to the respective electroplating tanks as make-up or treated and the solids hauled to a suitable land disposal site.

CONCLUSIONS AND RECOMMENDATIONS

The quality of the effluent from the plating operations does not meet the limits set out in the City of Windsor Sewer-Use By-Law for industrial waste discharges.

To lower metal and cyanide concentrations, the Company should consider, as a first step, installation of drag-out tanks following tanks containing electroplating solutions in order to retain and re-use the drag-out from the plating operations and minimize chemical losses to the sewer. This may reduce the toxic concentrations of metals and cyanide in the final effluent to an acceptable level for discharge to the City of Windsor sanitary sewers. However, in the event that in-plant control measures do not reduce the toxic ion contents to acceptable levels, waste segregation and chemical treatment should be considered.

In a similar manner, the batch discharges of the acid and alkaline cleaners should be retained to be neutralized and clarified before discharge to the sewers. The backwashes from the filters should also be collected and treated at the plant prior to discharge to the sewer.

CANADIAN MOTOR LAMP COMPANY LIMITED

The Canadian Motor Lamp Company Limited, located at 2429 Seminole Road in Windsor, manufactures wheel covers for the automotive industry.

DETAILS OF SURVEY

This Company was visited on June 21, 1968 as part of the industrial waste survey of Windsor. Grab samples of the effluents from individual processes and composite samples of the total plant effluent were taken.

Personnel Interviewed

Mr. J. Thachuck - Plant Supervisor

Mr. W. Milmer - Plating Supervisor

Description of Plant Processes

Canadian Motor Lamp Company Limited manufactures wheel covers for the automotive industry.

Stainless steel is cut and formed into wheel covers. The formed covers are buffed and then cleaned in an alkaline cleaning line to remove all oil and grease. All the wheel covers are cleaned in this manner but after cleaning, they are divided into two lines: the covers on the first are bonderized and painted, while the parts on the second line are chrome-plated.

The covers which are to be painted are put on a phosphating line where they are dipped in various solutions which deposit a coat of phosphate crystals of a controlled size. After this coating they are rinsed and sent to the paint shop.

The covers which are to be chrome-plated are dipped in acid, rinsed, and then electroplated in the conventional manner.

After electroplating or painting the wheel covers are inspected and packed. The rejects from the inspection are stripped and returned to the start of the cleaning process.

Operating Data

Employees	-	160
Operating Schedule		
Plant	-	16 hours/day
		5 days/week
Plating Line	-	8 hours/day
		5 days/week

Water Supply and Distribution

Supply	-	Windsor Utilities Commission
Volume (average over 1967)	-	205,000 gpd
Distribution		
Sanitary		5,000 gpd
Compressors		60,000 "
Plating		35,000 "
Cleaning		40,000 "
Phosphating		25,000 "
Boilers, Cooling etc.		40,000 "
		205,000 gpd

Sources of Liquid Wastes and Disposal

Liquid wastes from this plant originate from two main sources: the stamping area, and the phosphating and chrome-plating area.

The stamping area produces waste water which has been used in the compressors, in the boilers, and in cooling the stamping machinery. The majority of these wastes are considered to be uncontaminated cooling waters.

The phosphating and chrome-plating areas produce contaminated waste water, which may be described as follows:

(1) Waste water from the running rinse after drag-out in the chrome line.

(2) Waste water from the alkaline cleaning and degreasing line.

(3) Rinses from the phosphate line.

(4) Batch discharges of waste water which occur when the tanks in the stripping line are dumped.

(5) Slugs of waste containing chromium and of varying pH which occur when the deionizing units are regenerated. (This occurs about once a month.)

All waste waters enter the municipal combined sewer.

Proposed Waste Treatment

The Company plans to install a waste treatment system to handle the wastes before discharge to the combined sewer. The chromium-contaminated wastes are to be segregated and the chromium ions are to be reduced to the trivalent state by pH adjustment and the addition of sodium bisulphite in a sump (10 minutes retention). The reduced chromium-wastes are then to be mixed with the alkaline wastes from the cleaning line to induce chromium hydroxide precipitation. There are no concrete plans for the clarification of these wastes before discharge into the sewer.

Sampling and Analysis

Both composite and grab samples were collected. Two hour composite samples were taken of the total effluent from the electroplating tanks and the total effluent from the alkaline wash. Grab samples were taken of the running rinses after drag-out in both the electroplating lines, the rinse after the alkali dip in the second electroplating line, and the rinse in the phosphate line. The analytical results were as follows:

Sample Number	Solids		pH	Chromium		Phosphate as PO_4
	Total	Susp.		Total	Hexa.	
1	782	11	3.7	230	210	-
2	934	112	3.0	12	12	13.5
3	364	5	5.7	85	70	-
4	738	1	3.1	195	180	-
5	238	1	9.3	3.1	3.1	-
6	596	187	8.0	-	-	130.0

All analyses except pH reported in parts per million

Sample Description

1. - Composite from the Electroplating Line
2. - Composite from the Cleaning Line prior to Bonderizing
3. - Grab from the Running Rinse after Drag Out Line 1
4. - Grab from the Running Rinse after Drag Out Line 2
5. - Grab from Alkaline Rinse (Line 2)
6. - Grab from the Rinse on Phosphate Line

WASTE LOADING

Based on analytical results and estimated flow, the waste loadings from this plant are calculated to be:

Total Chromium	- 85 lbs/day
Phosphates as PO_4	- 30 lbs/day
Suspended Solids	- 92 lbs/day
pH Range	- 3.0 to 3.7

DISCUSSION OF FINDINGS

The Windsor By-Law regarding the quality of waste which may be discharged to a sanitary or combined sewer limits the amount of chromium, in any state, to 3 ppm. The wastes from the plating section in this plant exhibited a chromium content of 230 ppm which would suggest the need for an effective waste segregation and treatment system to reduce this content.

The proposed treatment of the waste - addition of bisulphite, lowering of pH to form a precipitate, and then a ten minute retention period to permit precipitation - will not be sufficient. There are no plans for the removal of the resulting hydroxide floc which would mean that, even though the chromium is reduced to the trivalent state, excessive concentrations of total chromium (i.e. trivalent and/or hexavalent) will still remain in the effluent.

The pH of the combined effluents from the plant is highly acidic. While this is a good condition for the reduction of the chromium to the trivalent state, it is totally undesirable if the waste is to be dumped, directly into the sewer system.

CONCLUSIONS AND RECOMMENDATIONS

At present the wastes from Canadian Motor Lamp Company Limited are unacceptable for discharge into the municipal sewers due to the high chromium content and low pH conditions. It would not appear that this situation will be greatly alleviated by the Company's proposed waste treatment works unless some settling facilities after the chemical treatment, are provided.

It is recommended that the Company investigate means of removing the chromium and providing proper neutralization before the wastes are allowed to enter the municipal sewers.

CHAMPION SPARK PLUG COMPANY OF CANADA LIMITED

Champion Spark Plug Company of Canada Limited, is engaged in the manufacture of automotive, marine, and industrial spark plugs. The plant is located at 1624 Howard Avenue.

DETAILS OF SURVEY

The survey was carried out on the morning of Wednesday March 21,1968. Samples were collected on March 21 and May 9, 1968.

Personnel Interviewed

Mr. A. W. Ferguson - Plant Engineer

Mr. T. Barmeter - General Foreman

Description of Plant Processes

This Company is engaged in the manufacture of the "Champion" brand of spark plug. A complete plug consists of three sub-assemblies: the barrel, the procelain and the electrode section. The barrel is stamped, machined and threaded at this plant. The porcelain is imported from plants in the United States and the centre electrode is inserted into this porcelain jacket at this plant.

Prior to assembly, the barrels are zinc-plated using a low cyanide content solution. In preparation for electroplating the parts are cleaned in an alkali cleaner, rinsed, dipped in dilute sulphuric acid (H_2SO_4) and rinsed again. After electroplating, the barrels are rinsed, dipped in a solution containing chromates and nitric acid, rinsed, immersed in "Macro leach", rinsed and dried in a centrifuge.

The plugs are then assembled, inspected and boxed for shipment.

Operating Data

Employees	-	250
Operating Schedule	-	16 hours/day

Water Supply and Distribution

Source	-	Windsor Utilities Commission
Volume (average over 1967)	-	130,000 gpd

Estimated Distribution

Plating Department	30,000 gpd
Cooling, Air Scrubbers, etc.	95,000 gpd
Sanitary	5,000 gpd
	130,000 gpd

Sources of Liquid Wastes and Disposal

The major portion of the liquid wastes originates from the electroplating operations. The flows from this section are comprised of:

(1) Rinse after cleaning of parts.

(2) Rinse after acid etching of parts.

(3) Two rinses after electroplating.

(4) Rinse after chromate and nitric acid dip of electroplated parts.

(5) Rinse after leaching dip.

(6) Final rinses.

The total flow from these operations amounts to approximately 30,000 gpd. There are, as well, three batch dumps which occur as follows:

Cleaning Solution	- once per month
Acid etch solution	- once per month
Chromate and nitric acid	- twice per week

The cleaner and acid solutions are dumped together to achieve some degree of neutralization.

There are two other sources of liquid wastes. The first is comprised of cooling water from the compressors, a portion of which is directed to the rinse tanks in the electroplating line while the remainder is sewered. Two cyclone-type dust removal units with water spray scrubbers are used to rid exhaust gases of porcelain fines. The dust-laden water is passed through two settling basins prior to discharge to the sanitary sewers.

Sampling and Analysis

Composite samples were obtained on March 21, 1968 of the four running rinses after the cleaning, etching, electroplating and fixing operations. An additional sample of the rinsing after electroplating was taken on May 8, 1968. The analytical results were as follows:

March 21, 1968	Solids			pH	Cyanide	Zinc	Total Chromium
	Total	Susp.	Diss.				
Rinse after Cleaning Cycle	564	69	495	11.1	-	-	-
Rinse after Pickling Cycle	1,486	2	1,484	2.0	-	-	-
Rinse after Electro-plating Cycle (Tank #1)	1,112	44	1,068	11.8	45.0	18	-
Rinse after Fixative Cycle	718	12	706	4.6	.03	50	122

Analytical Results (cont'd)

May 9, 1968	Solids			pH	Cyanide	Zinc	Total Chromium
	Total	Susp.	Diss.				
Rinse after Electro-plating Cycle (Tank #1)	698	123	575	11.4	18	40	-
Combination of Electro-plating Cycle Rinses (Tanks #1 and #2)	666	100	566	11.2	17	38	-

DISCUSSION OF FINDINGS

The individual waste streams from Champion Spark Plug Company of Canada contained extremely high concentrations of zinc, chromium and cyanide. The pH values of the individual running rinses greatly exceeded the limits set in the City of Windsor Municipal Sewer-Use By-Law.

The samples of the rinses were taken immediately after the barrels were immersed in the tanks, therefore, the concentrations determined are probably a maximum. With additional dilution obtained from mixing with plant cooling waters, these concentrations can be used to show a theoretical final effluent concentration of:

Zinc	- 4 ppm
Cyanide	- 3.0 ppm
Total Chromium	- 7.5 ppm

On the basis of these extrapolated results, the cyanide and total chromium concentrations are in excess of the municipality's limits for discharge to a sanitary or combined sewer. Since about 80% of the total volume of sewered wastes from this plant consist of uncontaminated waters used to cool plating tanks and compressors throughout the plant, it would be advisable to segregate

the plating wastes so they can be treated to reduce the toxic ion contrations to acceptable limits. Treatment procedures for this type of waste usually involve alkaline chlorination with chlorine or hypochlorite to destroy the cyanide content, followed by neutralization and settling to reduce the metal content. In addition in-plant control measures on the electroplating line could be utilized to reduce chemical losses to the sewer. These measures may consist of installing standing drag-out tanks after each plating bath or providing fog sprays over the plating tanks to retain a majority of the drag-out.

The total amounts of chromium, zinc and cyanide lost from this plant to the sewers can be calculated using the extrapolated concentrations and the total waste flow of approximately 130,000 gpd. The losses may be summarized as follows:

Total Chromium	- 9.8 lbs/day
Zinc	- 5.2 lbs/day
Cyanide as HCN	- 3.9 lbs/day

Unfortunately a sample of the waste waters from the scrubbing operation could not be obtained during the course of this visit. It is suspected however, that the suspended solids concentration in this waste source may be excessive and, therefore, further investigation in this area may be warranted in the future.

CONCLUSIONS AND RECOMMENDATIONS

The concentrations of the contaminants noted in the waste discharge are in excess of the limits prescribed in the Windsor Municipal Sewer-Use By-Law. It is, therefore, recommended that in-plant control and treatment measures be initiated by the Company to reduce the levels of these contaminants. Clean cooling waters should be segregated and if possible discharged to a storm sewer to reduce the hydraulic loading on the municipal sewage treatment plant.

It is also recommended that the Company investigate the waste flow from the exhaust gas water scrubbing units to determine whether the suspended solids content meets the City's By-Law stipulation. If it does not comply with City regulations then appropriate action should be taken to reduce the suspended solids content.

EAST SIDE PLATING COMPANY LIMITED

East Side Plating Company Limited manufactures bumpers, grills, trim, etc., for the automotive industry at the plant site at 9100 Tecumseh Road East. Being a major electroplating establishment with a direct waste discharge to an open watercourse, this plant has been the object of numerous industrial waste surveys by staff of the OWRC during the past four years.

The industrial waste abatement situation at this plant has progressed from a condition of minimal treatment of the electroplating wastes, with the accompanying discharge of poor quality wastes to the Little River, to the installation of complete waste treatment facilities. Nevertheless, OWRC visits and inspections of this plant subsequent to the start-up of the completed waste treatment system in August 1966, revealed that the system was not continuously producing a quality of waste acceptable for discharge to a watercourse. A reason for this failure could be attributed to poor performance of some units in the waste treatment system, and hence recommendations for corrective measures were made to the industry.

Since then the Company has installed automatic pH control and recording equipment in an attempt to rectify the existing problem. The Company is presently installing a new treatment system (Lancy System) to replace the existing chromium and nickel treatment facilities. Once these changes and alterations have been completed this industry will be surveyed by the staff of the OWRC to determine what improvement has been made.

Presented below is a summary of the information obtained during previous (1965-67) visits to the plant by OWRC staff.

Personnel Interviewed

Mr. C. J. DeYoung	- President
Mr. W. Koch	- Plating Supervisor

Description of Plant Processes

In the manufacture of bumpers, which is the main process in this plant, the steel sheets are cleaned, cut and stamped to the desired shapes. These parts are finished by the application of a protective and decorative plate on the metal parts.

In the electroplating process, the unfinished metal part first goes through a cleaning cycle which prepares the metal surface. The parts are then electroplated successively in a nickel plating solution and chromium plating solution. After drying the finished electroplated part is ready for shipping.

Smaller parts, some consisting of aluminum, are formed by cutting, stamping and then anodizing to form an oxide film on the metal surface.

Operating Data

Employees	- 300 (approximately)
Operating Schedule	- 8 to 24 hours/day 5 days/week
Raw Material	- Sheet metal and aluminum rods

Water Supply and Distribution

Source	-	Municipal Supply
Volume (average over 1967)	-	350,000 gpd
Distribution		
Sanitary and Domestic		6,000 gpd
Plating and Anodizing		270,000 gpd
Cooling		60,000 gpd
Other Uses (boiler etc.)		14,000 gpd
		350,000 gpd

Sources of Liquid Wastes and Disposal

Wastes originate within this plant from the anodizing and electroplating operations. As a result, chromium, nickel, iron and aluminum constitute the major toxic metal ions found in the wastes; while the fluctuating pH range of the wastes, which can vary from strongly acidic to strongly alkaline, is also an important factor in the quality of the waste effluent.

Wastes from the above operations are segregated and directed to difference portions of the waste treatment system before discharge into the Little River.

Description of Waste Treatment System

Basically the waste treatment system consists of waste segregation, chromium precipitation and settling, neutralization and metal hydroxide precipitation and settling.

The chromium treatment makes use of a new inovation - a "Novator". This unit utilizes the reaction of barium carbonate with chromium to form an easily settleable barium chromate precipitate.

Neutralization occurs in a wet well where the pH of the wastes is adjusted automatically to within a range of 6 to 8. The neutralized wastes then proceed to a settling area where a retention time of about 8 hours is provided to settle the insoluble metal hydroxide.

Sludge from the settling area is pumped to a sludge bed where the liquid is decanted back to the lagoons and the sludge, after drying, is removed to the City of Windsor landfill site.

Recently the OWRC has approved the installation of a new Lancy treatment system that will eliminate a number of existing units. This new operation permits "on line treatment" and allows for the recirculation of a portion of the wash waters and rinse.

Sampling and Analysis

No samples were taken at the time of this survey and previous results will not be included since many improvements have since been made. However, waste strengths of 2.0 ppm chromium and 11 ppm nickel could be considered as being reasonable prior to installation of the Lancy System.

WASTE LOADINGS

The waste loadings from this plant were calculated using an average plating waste flow of 270,000 gpd and the average chromium and nickel concentrations at times when the pH of the wastes was above 7.0. These conditions were chosen because they would represent a true picture of the characteristics of the wastes if proper neutralization was being achieved.

The loadings and concentrations are as follows:

Total Chromium	- 2 ppm or 5.4 lbs/day
Total Nickel	- 11 ppm or 29.7 lbs/day

DISCUSSION OF FINDINGS

It was clearly seen in the past that the wastes discharging from this plant to the Little River were in the majority of cases, unacceptable for discharge to a watercourse. This was largely due to the lack of consistent pH control.

To overcome the problems the Company has received OWRC approval to install a new Lancy waste treatment system. This system is now being installed. Because the system permits the recirculation of wash waters and rinses it is expected that the volume of wastes discharged will be reduced considerably.

CONCLUSIONS AND RECOMMENDATIONS

At the present time the industry is working at improving the present treatment system, and, on completion of these alterations, an intensive industrial waste survey will be conducted by the OWRC. With proper operation of the new works, the waste from this industry should meet the OWRC recommended objectives for discharge to a watercourse on a continuous basis.

INDUSTRIAL PLATERS

Division of Hedgewick Enterprises Limited

This plant is located at 1276 McDougall Street and is engaged in the finishing and electroplating of small automotive metal parts manufactured elsewhere.

DETAILS OF SURVEY

The Industrial Platers plant was visited on February 26 and samples of the liquid waste effluent were taken on February 29, 1968.

Personnel Interviewed

Mr. J. Scislowski	-	Plant Manager
Mr. L. Horodyski	-	Maintenance Superintendent

Description of Plant Processes

The finishing operations in this plant comprise of two phosphating lines. The metal parts are cleaned in detergent baths, rinsed in running water tanks and then treated in the phosphate and dichromate baths. The parts are rinsed prior to drying and shipping.

Electroplating operations are carried out in five separate lines. The main line is a conventional hoist-type Copper-Nickel-Chrome line with the accompanying counter-current, still, reclaim and running rinses. Other electroplating operations are carried out in an automatic nickel line (intermittently), a cadmium line, an automatic zinc rack line and a zinc barrel line. Running rinses are usually employed after each of these operations.

Operating Data

Employees - 25

Operating Schedule - 9 hours/day

5 to 5 1/2 days/week

Water Supply and Distribution

Source - Municipal Supply

Volume (average over 1967) - 90,000 gpd

Distribution

Domestic	500 gpd
Copper-Nickel-Chrome Line	25,000 "
Zinc Barrel Line	20,000 "
Zinc Rack Line	14,000 "
Cadmium and Nickel Line	10,000 "
Phosphate Lines	10,000 "
Other Uses (boiler, cooling etc.)	10,500 "
	90,000 gpd

Sources and Disposal of Liquid Wastes

All sanitary and industrial wastes are discharged to the municipal sanitary sewers on McDougall Street.

The industrial wastes result from the running rinses following the various cleaning, dipping and electroplating operations, the batch dumping of spent acid and alkaline cleaners, and the periodic back-washing of several electroplating solution filters.

Sampling and Analysis

A composite sample of the final effluent to the sanitary sewer and several grab samples of various running flows in the plating lines were taken on February 29, 1968 and again on May 8, 1968.

The results of the analyses on the collected samples are as follows:

Sample Number	Solids		Zinc	Chromium		Cyanides		Copper	Nickel	Cadmium
	Total	Susp.	as Zn	Total	Hexa.	as HCN	pH	as Cu	as Ni	as Cd
1	544	131	8*	1.1	0.6	3.1	7.2	1.8	2.5	1.8
2	672	187	-	-	1.5	4.4	9.5	-	2.5	1.5
3	-	89	25	-	-	47.6	11.3	-	-	-
4	-	10	-	-	40	-	6.9	-	-	-
5	-	22	-	-	-	137.8	10.9	-	-	180

* Estimate from dilution considerations

All analyses except pH reported in parts per million

Sample Description

1. - Final Effluent to Sewers (February 29)
2. - Final Effluent to sewers (May 8)
3. - Rinse Following Zinc Plate (February 29)
4. - Rinse Following Chrome Plate (February 29)
5. - Rinse Following Cadmium Plate (February 29)

WASTE LOADINGS

The waste loadings were computed using average daily flow figures and average analytical results of the final effluent samples.

These figures were:

Cyanide as HCN	-	3 lbs/day
Zinc	-	7.2 lbs/day
Copper	-	2 lbs/day
Chromium	-	1 lb/day
Suspended Solids	-	135 lbs/day
Cadmium	-	2 lbs/day
Nickel	-	2.2 lbs/day
pH Range	-	7.2 to 9.5

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

The results of analyses performed on the composite samples of the final effluent revealed an average cyanide concentration of 3.7 ppm. This is above the recommended limit of 2 ppm as set out in the City of Windsor Sewer-Use By-Law for discharge to a combined or sanitary sewer.

This industry has changed over to a low cyanide content plating solution in one zinc electroplating line, and at the time of this survey, was in the process of changing over in the other zinc line. This will serve to reduce the cyanide content in the effluent and, on the completion of this alteration, it is hoped that the above concentration will be below or close to the recommended limit. In the event that this is not the case, then consideration should be given to the elimination or destruction of the cyanide ions by: (a) Modifications in the design and/or operation of the plating line processes, such as the use of fog nozzle sprays and still drag-out rinses which can be reused in the respective electroplating tanks.

(b) Installation of chemical treatment facilities to incorporate the principle of oxidation of cyanides by hypochlorite or chlorine at a high pH to non-toxic substances.

Other contributory sources of cyanides to the sewers are the rinses following the cadmium and copper electroplating operations. While the volumes of these wastes are not as significant as those generated in the zinc lines, the actual concentrations of cyanide are much greater because of the greater strength (cyanides) of the electroplating solutions. Therefore, the treatment of these wastes must also be considered along with the zinc wastes in the event that in-plant changes and modifications are not able to reduce the cyanides in the effluent to acceptable levels.

Another point of concern in an operation such as this is the intermittent discharge of high strength wastes to the sewers. These may take the form of spent cleaners, back-washing of the various electroplating solution filters and spent electroplating solutions. These periodic discharges should be retained for chemical treatment to control the pH and the concentrations of toxic ions (Cu, CN, Cr, etc.) before discharge to the sewer.

With the exception of the concentration of cyanides, the concentrations of other toxic ions in the normal daily waste flow from this plant appeared to meet the requirements of the Windsor Sewer-Use By-Law.

It is hoped that the introduction of low cyanide zinc baths will serve to reduce the cyanide content in the final effluent to acceptable limits. If not, serious consideration should be given to the reduction of

cyanides by the implementation of drag-out rinses at the copper and cadmium plating baths and/or treatment of the total segregated cyanide wastes.

The intermittent discharge of high strength wastes may prove detrimental to the municipal sewerage system. It is, therefore, recommended that these discharges be retained for treatment prior to disposal.

PLASTICAST LIMITED

Plasticast Limited operates a large metal casting, stamping and finishing plant at 3324 Marentette Avenue.

This industry was visited by OWRC personnel on several occasions during the early part of 1968, and in March, a comprehensive industrial waste survey was conducted. Briefly, the survey and other visits, revealed that treatment of the liquid wastes generated by the electroplating operations was inadequate. It was subsequently recommended, through correspondence and several meetings with Plasticast Limited personnel that the industry take the necessary steps to improve the efficiency of the various waste treatment units with a view to providing an acceptable effluent to the roadside ditch on Marentette Avenue.

Since these points were brought to the attention of Plasticast Limited, the industry has demonstrated an ability to reduce the concentrations of the undesirable components by in-plant control measures. The industry has also retained a consulting engineer to review the entire waste treatment operation with a view to correcting the existing problems.

A summary of the data obtained during the March 1968 survey of Plasticast Limited is as follows:

Personnel Interviewed

Mr. J. Sandwich	- Plant Engineer
Mr. J. Mierlobensteyn	- Chief Chemist
Mr. B. Roberts	- Stationary Engineer

Description of Plant Processes

This industry manufactures and finishes metal die-castings for the automotive and hardware industry.

Zinc ingots are melted, cast, and stamped to the desired forms and then buffed prior to the finishing operation. The finishing involves the cleaning, pickling and electroplating of the metal parts in a fully automatic copper-nickel-chrome electroplating line.

The metal parts are first cleaned in emulsion and alkaline cleaners, spray rinsed, immersed in an acid dip, and again rinsed before being electroplated. The electroplating operations consist of a copper strike, copper plate, electro-cleaner, nickel plate (both "semi-brite" and "brite") and chromium plate. After each operation, with the exception of the copper circuit, there is at least one drag-out tank and rinse tank to collect and wash off any adhering plating solution.

The electroplated parts are inspected for quality of finish and any defective products are stripped and replated.

Operating Data

Employees	- 800 approximately
Operating Schedule	- 1 to 3 shift/day 5 days/week
Raw Materials	- Zinc ingots and electroplating and waste treatment chemicals

Water Supply and Distribution

Source	-	Municipal Supply
Volume (average)	-	490,000 gpd
Distribution		
Electroplating		160,000 gpd (measured)
Cooling		308,000 gpd (measured)
Sanitary and Domestic		16,000 gpd
Other		6,000 gpd
		490,000 gpd

Sources of Liquid Wastes and Disposal

The wastes from the electroplating line operations constitute the major source of waste from this plant and comprise mainly of overflow rinse waters and spray rinses following the immersion of the parts into the various drag-out tanks. These wastes are collected in separate sewers and sumps for the purpose of segregation into cyanide, chromium and nickel-acid-alkaline bearing waste streams before treatment in the respective waste treatment facilities.

Spent acid and alkaline cleaners are dumped periodically to holding tanks for land disposal by an industrial waste disposal contractor. Previously these dumps were directed to the waste treatment facilities, but poor operation of the pressure filters, attributed to the cleaners, necessitated the complete segregation of these dumps from the system.

The plating solutions are never dumped. The nickel sulphate and copper cyanide solutions are continuously filtered, cooled, purified, and re-used. There are three filters on the copper circuit and three others on the nickel tanks. These filters are periodically back-washed and the resulting waste directed to the appropriate sewer system for treatment.

Other sources of industrial waste waters include the cooling water used in the die-casting and stamping operations, back-washing of the water-softner and de-ionization units, and cooling water used in two compressors. These wastes are discharged directly to the roadside ditch.

Domestic wastes are discharged to a septic tank with an overflow to the sanitary sewer on Marentette Avenue.

Description of Waste Treatment Facilities

The existing system consists of facilities for the alkaline chlorination of cyanide wastes, sulphonation of chromium-bearing wastes, final pH adjustment, and pressure filtration for solids removal prior to discharge to the roadside ditch on Marentette Avenue.

Sampling and Analysis

On March 20, 1968 samples of the plant effluent were taken at 30 minute intervals and composited over two three-hour periods. (9.30 a.m. to 12.30 p.m. and 1.30 p.m. to 4.30 p.m.)

The analytical results of the samples taken were as follows:

Date	pH	Suspended Solids	Cyanides as HCN	Chromium Total	Chromium Hexa.	Nickel Total	Nickel Diss.	Copper Total	Copper Diss.
March 20	(i) 7.0	30	1.8	1.1	0	156	137	13.0	4.5
	(ii) 7.8	49	6.6	4.5	0	19	19	13.1	10.9

Note: All results reported in parts per million (ppm), except pH.

WASTE LOADINGS

The waste loadings from this plant were calculated by using a daily electroplating waste flow of 160,000 gpd and the average analytical results obtained on the visit on March 20, 1968. The concentration of nickel found in the morning sample was excessively high and for this reason no average was taken but instead the afternoon concentration of 19 ppm was used. The loadings on this basis were as follows:

Suspended Solids	- 64 lbs/day
Total Chromium	- 4.5 lbs/day
Nickel	- 30.4 lbs/day
Copper	- 21.0 lbs/day
Cyanides	- 7.0 lbs/day
pH Range	- 7.0 to 7.8

DISCUSSION OF FINDINGS

(1) Wastes To Ditch

There are two sources of waste flows which emanate from this plant to the roadside ditch on Marentette Avenue:

(a) Cooling waters from the die-casting and stamping operations are pumped to the roadside ditch. A sample of this waste on January 23, 1968, revealed that the quality of this flow was acceptable for direct discharge to a watercourse. The volume of this flow (308,000 gallons/day) was determined by taking hourly meter readings on the water supply line serving this section of the plant.

(b) After treatment, the plating wastes are discharged via gravity to another section of the roadside ditch. From the analytical results taken during this survey, the quality of these wastes was unacceptable and OWRC objectives for suspended solids, cyanides, chromium, copper and nickel concentrations were exceeded. The volume of this waste flow was rated at approximately 160,000 gallons per day by the same procedure used for determining the volume of cooling water in the fabrication section.

(2) Efficiency of Waste Treatment

Cyanide destruction was found to be inadequate. Analytical results of cyanide wastes before and after treatment showed the efficiency of the two-stage finalizer to be 17.9% in the morning and afternoon respectively. Moreover similar efficiencies were recorded during the January sampling programme.

A reduction of the chromates to the trivalent chromic salts was effected in the chrome treatment unit as the hexavalent chromium content was reduced from 512 parts per million to 39 parts per million (or 93% reduction) on March 20, 1968. Similar efficiencies were obtained during previous sampling programmes.

Improper pH control was found to exist in the neutralization basin. At this stage of treatment, it becomes important to maintain the pH in this sump between 8.0 to 8.5 for optimum precipitation of the metals.

The pressure filters operated on a regular 16 to 18-hour basis (i.e. one day's operation) before being cleaned and gave solids removal efficiencies in excess of 94% during this survey.

CONCLUSIONS AND RECOMMENDATIONS

It was found, as a result of this survey, that the Company discharged wastes of an unacceptable quality to the roadside ditch on Marentette Avenue. This effluent, from the electroplating section, exceeded the OWRC objectives for a discharge to a watercourse in terms of copper, nickel, chromium, cyanides and suspended solids concentrations.

The efficiencies of the various units comprising the system were determined. The chromium reduction and pressure filtration efficiencies were found to be in excess of 90%, however, neutralization and cyanide destruction were not effective due to inadequate pH control in the case of neutralization and poor waste segregation, insufficient chlorine addition, and hydraulic overloading of the treatment unit in the case of the cyanide destruction.

It was recommended that the industry implement changes in the operation of the waste control and treatment system to effect an improvement in the quality of the wastes being discharged to the roadside ditch on Marentette Avenue. These changes were to include improvement of the waste segregation system, reduction of the cyanide and chromium loadings discharging to the respective treatment units, improvements in the cyanide treatment, better pH control in the neutralization basin, revision of the waste monitoring programme and finally, the installation of additional waste treatment units as required, preferably with more automatic control. The industry has since retained the services of a consulting engineer to review the entire waste treatment system in an effort to correct the above mentioned problems.

RUSTSHIELD PLATING LIMITED

Rustshield Plating Limited, located at 700 Wellington Street, is engaged in the plating and phosphatizing of small automotive parts.

DETAILS OF SURVEY

This plant was visited on April 4, 1968, and the waste effluent sampled.

Personnel Interviewed

Mr. D. C. Stewart - Vice-President

Description of Plant Processes

This small electroplating shop has facilities for zinc, cadmium, copper and nickel plating: however, nearly all electroplating is now of the zinc variety. Other parts are phosphatized by immersion in a phosphate bath. A description of a typical cycle is as follows: The article is cleaned in a caustic solution, rinsed in cold water, etched in acid, rinsed again and then either electroplated or phosphatized. After the last step the article is rinsed in a series of cold water rinses and set aside to dry. Only zinc electroplating and phosphatizing was being carried out on the day of the survey.

Operating Data

Operating Schedule - 8 hours/day
6 days/week

Employees - 10

Water Supply and Distribution

Source	-	Windsor Utilities Commission
Volume (average over 1967)	-	10,000 gpd
Distribution		
Sanitary		500 gpd
Process		9,500 gpd
		10,000 gpd

Sources of Liquid Wastes and Disposal

Wastes from this plant originate from the rinsing of articles during and following the electroplating and phosphatizing operations. The running rinses after the cleaning and etching steps along with the rinses after electroplating and phosphatizing operations are discharged to the combined city sewers. All running rinses spill into the basement through cracks in the floors and no effort is made to segregate the wastes prior to discharge to the sewers.

Occasionally, spent cleaning and etching solutions are dumped to the sewers. The frequency of dumping is dependent on the volume of work which passes through the tanks.

Sampling and Analysis

A grab sample of the total plant effluent was obtained from a sump located in the basement of the building. The analytical results, as determined at the OWRC Toronto Laboratory, are presented on the following page.

Sample	Solids Total	Solids Susp.	Cyanide as HCN	Zinc as Zn	Phosphates as PO_4	pH at Lab
Effluent to Sewer	338	37	0.1	9.6	14.0	6.0

All analyses except pH reported in parts per million

DISCUSSION OF FINDINGS

Analytical results of the final plant effluent at the sump located in the basement of the plant revealed that the concentrations of zinc, cyanide and suspended solids were all within the City's By-Law limits. It should be pointed out, however, that periodic batch discharges of cleaners, acids, or other electroplating line baths could result in extremely high and objectionable waste loadings. Measures should be taken to minimize the effect of such shock loadings on the sewage collection and treatment system by neutralizing the acid and alkaline dumps, and chemically treating and settling the electroplating bath dumps before discharge to the sewers.

CONCLUSIONS AND RECOMMENDATIONS

Based on analytical results of the grab sample obtained of the total combined plant effluent it would appear that the wastes, resulting from normal processing operations, are acceptable for disposal into the municipal sewage system.

However, batch dumpings of spent cleaners or electroplating chemicals must be handled in an alternate and more suitable manner.

UNIMCO LIMITED

The Walker Road plant of Unimco Limited is engaged in the stamping and finishing of various styles of fasteners for the textile industry.

DETAILS OF SURVEY

This plant was visited on April 2, 1968 and samples of the waste flows were obtained.

Personnel Interviewed

Mr. T. C. Stewart - General Manager

Mr. O. Beneteau - Engineering Manager

Description of Plant Processes

This Company purchases sheets of brass or steel metal from outside suppliers. From these, various styles of fasteners are punched. They are then deburred, and coated with a soluble oil rust preventative. Some fasteners receive a surface plate of nickel, copper or brass, on a conventional electroplating line using the following cycle:

(a) a cleaning operation

(b) two counter current running rinses

(c) an acid etching operation

(d) two more counter current running rinses

(e) electroplating step (one of 4 types)

(f) a dragout bath (not after every electroplating bath), and

(g) two final counter current running rinses.

All brass parts are nickel electroplated. Steel fasteners receive either nickel, cadmium, copper or brass finishes depending on customer specifications.

Operating Data

Employees	-	50
Operating Schedule	-	16 hours/day
		5 days/week

Water Supply and Distribution

Source	-	Windsor Utilities Commission
Volume (average over 1967)	-	20,000 gpd
Distribution		
Plating		15,000 gpd
Sanitary		1,000 gpd
Cooling, etc.		4,000 gpd
		20,000 gpd

Sources and Disposal of Liquid Wastes

The major source of liquid wastes originates from the rinsing operations in the electroplating department. Each of the five running rinses discharges an estimated 3,000 gallons per day to the City's combined sewers. Half of the water used in each running rinse tank is recycled water used elsewhere in the plant while the remainder is obtained from the City.

There are periodic batch dumps of spent acids, cleaners and filter backwash to the sanitary sewer. Cooling and sanitary wastes are also discharged to this sewer.

Sampling and Analysis

Since a representative sample of the final effluent from this plant could not be obtained, grab samples were taken of each of the rinses following the cleaning, etching and plating steps. The samples were analysed at the OWRC Toronto Laboratory. The analytical results are:

Sample Number	pH at Lab	Cyanides as HCN	Copper as Cu	Nickel as Ni	Cadmium as Cd
1	9.5	-	-	-	-
2	6.8	.01	-	72.4	-
3	10.0	88.0	-	-	29
4	6.8	-	-	-	-
5	10.0	93.0	18.1	-	-

All analyses except pH reported in parts per million

Sample Description

1. - Rinse after cleaning cycle - Grab
2. - Rinse after nickel plate - Grab
3. - Rinse after cadmium plate - Grab
4. - Rinse after acid dip - Grab
5. - Rinse after copper plate - Grab

DISCUSSION OF FINDINGS

The samples were obtained following the individual electroplating operations and hence do not represent the actual concentrations in the combined effluent to the sewers. Assuming a dilution of 6:1 with the other

flows, the toxic ion concentrations and loadings in this combined flow of 15,000 gpd are estimated to be:

Cyanides as HCN	- 30 ppm	or	4.5 lbs/day
Cadmium as Cd	- 5 ppm	or	0.8 lbs/day
Copper as Cu	- 3 ppm	or	0.5 lbs/day
Nickel as Ni	- 12 ppm	or	2.0 lbs/day

In order to regulate the discharge of industrial wastes to the municipal sewage system, the City of Windsor has a Sewer-Use By-Law setting forth maximum concentrations of contaminants that will be accepted in the sanitary sewer. The projected concentrations from this plant, as calculated using dilution waters, are far in excess of these prescribed limits, and as a result, should be lowered to comply with By-Law requirements.

Treatment procedures for this type of waste usually involve the alkaline chlorination of all wastes containing cyanides, followed by neutralization and settling of the combined wastes to control the pH and reduce the toxic metal ion levels respectively. In view of the relatively small volume of wastes, treatment would probably be best accomplished in a small batch system utilizing one or two treatment units to contain the total daily contaminated waste flow.

CONCLUSIONS AND RECOMMENDATIONS

Wastes from this plant contain high concentrations of nickel, copper, cadmium and cyanide. Any of these contaminants may pose a problem to the new municipal sewage treatment system. The Company should, therefore, investigate methods of reducing or eliminating the concentrations of toxic materials in their effluent.

WINDSOR CHROME PLATING COMPANY LIMITED

This plant is located at 2700 Ouellette Avenue and is engaged in reconditioning of automobile bumpers.

DETAILS OF SURVEY

This plant was visited on January 24, 1968 and samples of the effluents from the plant taken.

Personnel Interviewed

Mr. P. Boscarial - Manager

Description of Plant Processes

The Company's main operation is the reconditioning of automobile bumpers, but a certain amount of specialty electroplating work is also done. The reconditioning operation is carried out in a conventional nickel-chrome electroplating line after the associated cleaning steps.

Operating Data

Employees	- 20
Operating Schedule	- 8 hours/day
	5 days/week

Water Supply and Distribution

Source	- Windsor Utilities Commission
Volume (average over 1967)	- 10,000 gpd (approximately)

Distribution

Sanitary	500 gpd
Industrial	9,500 gpd
	10,000 gpd

Sources and Disposal of Liquid Wastes

The major source of industrial wastes originates from running cold water rinses following the alkaline and acid cleaners and after the spray nickel-dragout tank in the bright nickel line. The still rinse following the semi-bright nickel and the dragout from the bright nickel are continuously emptied into a large storage tank. From there, the liquid is returned to the respective nickel tanks as make-up. The nickel filters are backwashed every 4 to 6 weeks and wastes collected and clarified in drums. The supernatant liquid is returned to the nickel storage tank, whereas the settled sludge is disposed of at a land disposal site.

The spray water following the chromium plating is contained in a dragout tank, and concentrated by evaporation methods for re-use in the process. The cold still rinse after this dragout tank is constantly treated with sodium metabisulphite to reduce the chromium to the trivalent state. The final still hot water rinse in the chromium line is treated in a similar manner before bleed-off into the sewers every Saturday morning along with the treated cold still rinse water. The resulting sludge in the two chromium rinse tanks is trucked away for disposal.

Sampling and Analysis

A composite sample of the final effluent and grab samples of various rinse waters were taken.

The analytical results are presented on the following page.

Sample Number	Solids			pH at Lab.	Chromium		Nickel
	Total	Susp.	Diss.		Total	Hexa.	Total
1	290	3	287	1.8	0.5	0.0	2.3
2	258	3	255	7.1	0.15	.09	18.9
3	8,254	5	8,249	3.7	700	0.0	0.57
4	1,378	3	1,375	2.0	0.1	0.1	10.1

All analyses except pH reported in parts per million

Sample Description

1. - Running rinse after acid dip
2. - Running rinse after nickel plating
3. - Still rinse after chromium plating
4. - Composite of final effluent

DISCUSSION OF FINDINGS

The final plant effluent was not suitable for discharge to a storm sewer with respect to pH and the nickel concentration. The low pH recorded can be attributed to the running rinses following the acid dips while the nickel concentrations originated from the running rinse following the bright nickel plate.

The Company intends to install a large neutralization tank in the near future. This tank, located under the floor at one end of the plating line, would receive the acidic water rinses during the day's operation. The waters, then, would be neutralized and discharged to the sewer.

The reduction of the nickel concentration cannot be accomplished in such an easy manner. First, if all the nickel rinses are retained in a closed system to be used in the plating tanks, the additional volume supplied by the rinse after the bright nickel would make this system impractical. (That is, more wastes are retained than can be re-used in the plating tanks). Second, treatment of the nickel waste flow entails more elaborate equipment such as better settling facilities, sludge handling equipment, etc. This leaves in-plant control measures, such as fog spraying or water rinsing of the parts over the nickel dragout tank, as the only possible course of action open to the Company in order to reduce the nickel content in the final effluent unless further waste treatment and sludge handling facilities are installed.

CONCLUSIONS AND RECOMMENDATIONS

The final plant effluent exceeded OWRC objectives and the City of Windsor By-Law requirement with respect to the pH and the nickel concentration for discharge to a storm sewer. The Company is presently installing facilities to neutralize the wastes from the acid rinsing operation which should correct the pH problem. However, there are no present plans for the reduction of the nickel concentration. As a start, the Company should consider the installation of fog-sprays over the plating tank to retain the majority of the nickel dragout. In the event that this fails to bring the concentration of nickel to the desired level more elaborate methods should be considered.

THE BORDEN COMPANY LIMITED

The Borden Company Limited, located at 628 Monmouth Road manufactures whole, skim, and 2% milk, chocolate milk, cream, milk-shake mix and buttermilk.

DETAILS OF SURVEY

This plant was visited on February 28, 1968.

Personnel Interviewed

Mr. D. Henderson - Maintenance Supervisor

Description of Plant Processes

Raw milk is brought to the plant by bulk tank truck. It is cooled, separated and processed into various dairy products using conventional methods. The bottling line consists of a 300 gallon soaker bath and associated spray rinses.

Operating Data

Employees	- 125
Operating Schedule	- 8-9 hours/day 5 days/week
Raw Milk Intake (February 28, 1968)	- 70,000 lbs milk

Water Supply and Distribution

Source - Windsor Utilities Commission

Volume (gpd) (based on 1967 figures)	Maximum	Minimum	Average
	210,000	70,000	85,500
Distribution (gpd)			
Sanitary	4,000	2,000	
Process	82,000	41,000	
Cooling	124,000	27,000	

The figures for cooling on the previous page are based on the assumption that cooling water varies from 60% of total consumption in the summer to 40% of total consumption in the winter months.

Sources of Liquid Wastes and Disposal

The main flow from this plant is clean, uncontaminated cooling water used for refrigerative purposes. The largest contaminated flow results from bottle washing and periodic equipment and truck wash-up operations. All wastes, including sanitary wastes, are discharged to the city sewer which runs along Wyandotte Street to the north of the plant.

Sampling and Analysis

The accuracy of any samples taken at dairy processing operations in a short period of time is open to question due to the widely fluctuating flow patterns and waste characteristics of the resulting waste waters. Therefore, no samples were taken at this plant: but instead, projected waste loadings based on milk intake figures are presented for the purpose of this survey.

THEORETICAL WASTE LOADING

Process	lbs of BOD_5 per 10,000 lbs of milk received	Actual BOD_5 Waste Loading (based on 70,000 lbs milk)
Receiving and Cooling	4	28
Tank Truck Delivery and Washup	1	7
Storage of Fluid Milk	0.5	3.5
Milk Pasteurization	7	49
Cream Separation	4	28
Buttermilk (15% intake)	12	12
		127.5

The figures outlined in the table on the previous page are based on information taken from "An Industrial Waste Guide to the Milk Processing Industry" - U.S.P.H. publication.

The average theoretical BOD_5 waste loading based on an average milk intake of 70,000 lbs per day is 127.5 lbs per day. The projected daily waste loadings during periods of maximum (110,000 lbs/day) and minimum (50,000 lbs/day) production in the plant are approximately 180 lbs and 100 lbs BOD_5 respectively. These periods would be expected to occur in mid-summer and mid-winter.

CONCLUSIONS

Wastes resulting from normal operations at this dairy should not have a detrimental effect on operations at the municipal sewage treatment plant. It should be noted, however, that batch discharges of spoiled milk, and in particular buttermilk, will exert a tremendous loading on sewage processes and every effort should be made to prevent such an occurrence from happening.

The population equivalent from this plant based on 127.5 BOD_5 average loading was calculated to be 635 persons.

CANADA DRY BOTTLING COMPANY (WINDSOR) LIMITED

This plant is located at 2310 Walker Road and bottles ginger ale and other soft drinks.

DETAILS OF SURVEY

This plant was visited and sampled on April 3, 1968.

Personnel Interviewed

Mr. B. Humphrey - Production Manager

Description of Plant Processes

The manufacturing operations in this plant consist of the preparation and the blending of concentrated syrups, the dilution of this syrup by pre-treated water followed by bottling, carbonation and capping operations. Bottles are washed in a caustic line before being used in the bottling operation.

Operating Data

Employees	- 20 (varies with season)
Operating Schedule	- 7 hours/day (6 hours bottling)
	- 5 days/week

Water Supply and Distribution

Source	- Windsor Utilities Commission
Volume (average over 1967)	- 22,000 gpd (approximately)

Distribution

Products Usage	4,300 gpd
Rinse and Wash Waters	17,000 gpd
Sanitary and Domestic	400 gpd
Other Uses	300 gpd
	21,000 gpd

Sources of Liquid Wastes and Disposal

The major portion of the industrial wastes in this plant originates from the bottling and washing operations. The bottles are first pre-rinsed with water, then successively soaked in 4%, 2.5% and 1.5% caustic solutions. The bottles are given a final rinse in water prior to the bottling operations. Pre-rinse waters are passed through a screen prior to discharge to the sewer while the final rinse flows directly to the sewer.

Every three or four weeks the three tanks bearing the caustic solution are cleaned. About 65% to 75% of the solutions are reclaimed and the remainder dumped to the sewer. Sludge resulting from the reclaiming operation is disposed of in drums at an appropriate land disposal site. Twice each year all the solutions are dumped and completely renewed.

Other wastes are sanitary wastes, truck washings and floor wash-ups. All wastes are discharged to the combined sewer system on Walker Road.

Sampling and Analysis

The following grab samples were taken:

1. The pre-rinse, after screening, prior to discharge
2. 3.5% - 4.0% caustic wash solution
3. Final rinse waters.

The analytical results were as follows:

Sample Number	BOD_5	Solids		pH
		Total	Susp.	
1	14	320	51	9.1
2	2,800	43,768	843	10.9
3	1	184	3	9.7

All analyses except pH recorded in parts per million

CONCLUSIONS AND RECOMMENDATIONS

Based on the analytical results, the normal process wastes from this establishment are suitable for discharge to the municipal sanitary or combined sewers.

The infrequent batch dumps of alkaline cleaners would tend to have a detrimental effect on the sewer system due to the high pH, and, as a result, it is recommended that these tanks be bled slowly, where practicable, to the sewers to permit adequate dilution and neutralization by other rinse waters.

CARLING BREWERIES LIMITED

The Carling Breweries Limited operates a brewery at 515 Riverside Drive West in Windsor.

DETAILS OF SURVEY

This plant was visited on April 3, 1968 and samples of the waste flows from this plant were taken.

Personnel Interviewed

Mr. J. Starkey - Plant Engineer (Acting)

Description of Plant Processes

As in any typical brewery operation, the main processes are the malting of the barley, the brewing of the beer from this malt, and the storage, finishing and packaging of the product for market.

The malting process consists of preparing the barley to a state which facilitates direct fermentation with yeast. The preparation of the barley entails steeping in cold waters, germination for five to eight days, drying to a pre-determined moisture content and screening.

A malt adjunct (rice) is mixed with some malt and water and pressure cooked in a cereal cooker. The contents of this cooker are combined with more malt and heated in a mash tub to produce 'wort'. The 'wort' is strained in a lauter tub to get rid of insoluble matter, cooked with hops in a brew kettle, and then cooled. The cooled 'wort' is mixed with selected yeasts in open fermentors at a controlled temperature for a short period and then transferred to closed fermentors where the yeast gradually settles to the bottom, so that at the end of 7 to 10 days the fermented beer is ready to be vatted.

The beer is stored in vats (for 3 to 6 weeks) then carbonated and put in kegs for shipping.

Operating Data

Employees	-	40 (approximately)
Operating Schedule	-	24 hours/day
		5 days/week
Raw Materials	-	Malt, rice, hops, yeast
Production	-	3 brews/day

Water Supply and Distribution

Source	-	Municipal Supply
Volume (average over 1967)	-	200,000 gpd

Distribution

Sanitary and Domestic	1,000 gpd
Equipment and Floor Washing	30,000 "
Compressor Cooling Waters	10,000 "
Keg Washing	75,000 "
Production Usage	25,000 "
Refrigeration Water	25,000 "
Other Uses (boiler etc.)	34,000 "
	200,000 gpd

Sources and Disposal of Liquid Wastes

The malting process produces three types of wastes:

- those from the germinating operation
- those from the equipment washing operation
- those from the steep tank after the grain has been removed.

In this plant, the wash waters are discharged to the sanitary sewers on Bruce Street, while the semi-solid wastes from the other two operations are collected for sale as animal feed.

In the brewing process, the semi-solid wastes are also retained in a Hop Disposal System while the equipment wash waters are sewered. Another waste is produced when the top layer of yeast on the open fermenters is skimmed off to the sewer so that the lower layer can be revitalized in the process.

Cooling waters are recirculated with some bleed-off to the sewers. The keg wash waters (the main source of wastes) are discharged to a sewer on Pitt Street while other sources of wastes which include periodic backwashings of a carbon filter and water softener, are discharged to the sewers on Bruce Street.

Sampling and Analysis

Composite samples were taken of the two effluents to the sanitary sewer on Bruce Street. The analytical results of these samples are as follows:

Sample Number	BOD_5	Solids		COD	pH
		Total	Susp.		
1	29	266	30	90	6.9
2	50	1,000	125	94	3.5

Sample Description

1. - Effluent to Bruce Street Sewer (No. 1 location)
2. - Effluent to Bruce Street Sewer (No. 2 location)

DISCUSSION OF RESULTS

The strength and characteristics of brewery wastes varies greatly depending on the nature of the operations underway and because of this, a representative sample of total plant wastes could only be obtained by compositing over a full day's operation.

The results of the samples obtained at this brewery showed low concentrations of contaminants which would suggest one or all of the following points:

(a) The sampling period was far too short.

(b) The high strength waste producing operations (i.e. equipment and floor wash-ups) were not being carried out during the sampling programme.

(c) The sewers containing the high strength wastes were not sampled.

The third point is rather remote because these sampling points were also used during past OWRC surveys and therefore they should not be considered a questionable aspect of this survey. In order to obtain more realistic figures for the purpose of this inspection, concentrations obtained from literature sources, for a brewing operation with the waste grains sold in a semi-solid state, will be used.

The following figures are taken from "Sewage and Industrial Wastes" Volume 33, April 1961:

BOD_5	- 800 parts per million
Suspended Solids	- 400 parts per million

These concentrations should be lower, and more in line with the City of Windsor Sewer-Use By-Law in the effluent when one considers the dilution effect of relatively uncontaminated refrigeration waters, compressor cooling waters etc., in the same sewer.

The major source of waste from this plant originates in the keg-washing operation. A sample of this waste was not obtained during this survey; however, past experience with bottling washing operations indicate that alkaline (or high pH) conditions could conceivably exist in the waste

stream from this section. In addition, the batch dumpings of spent caustic used to clean kegs and equipment would create undesirable conditions in the sewers and as a result they should be handled in an alternative manner.

The waste loadings from this plant can be calculated using a volume of 30,000 gpd wash water and the BOD_5 and suspended solids concentrations of 800 ppm and 450 ppm thus:

BOD_5	-	250 lbs/day
Suspended Solids	-	135 lbs/day

The population equivalent based on the BOD_5 loading is approximately 1,200 persons.

CONCLUSIONS AND RECOMMENDATIONS

The wastes emanating from this plant are unlikely to have an adverse effect on the operation of the proposed sewage treatment facilities with the exception of the low pH of the wastes discharging to the Bruce Street sewer. The waste stream from the keg washing operation should be looked into by the Company to ensure that excessive alkaline conditions, which would be in contravention of the City's By-Law stipulations, do not exist. In addition, any batch dumping of concentrated alkali solutions to the sewers should not be permitted. Instead more suitable forms of disposal should be pursued such as neutralizing prior to discharge to the sewers.

The population equivalent of 1,200 persons from this plant was calculated using literature waste loading fugures from similar plants, since there is some indication that a representative sample of the normal daily waste effluent was not obtained from this plant on April 3, 1968.

The OWRC has recently been advised that this plant was permanently closed as of September, 1969.

CHUN KING CORPORATION OF CANADA LIMITED

This plant is located at 1019 Elliott Street West and produces "Chun King" and "Dragon" brands canned and frozen foods.

DETAILS OF SURVEY

The Chun King plant was visited on Febraury 28, 1968.

Personnel Interviewed

Mr. L. Eskol - Plant Manager

Description of Plant Processes

All vegetables and meats used as ingredients in the various dinners are thawed and washed prior to cooking. When these ingredients are cooked together, the cooking water is left in the final product as a broth. All products are then either quick frozen or kept refregerated prior to distribution.

Operating Data

Operating Schedule - 8 hours/day
5 or 6 days/week

Employees - 120

Water Supply and Distribution

All water is obtained from the Windsor Utilities Commission at an average daily rate of 120,000 gallons. The actual distribution of the water is unknown but it is presumed that the major portion is used for refrigerative purposes and as such is uncontaminated when discharged.

Sources and Disposal of Liquid Wastes

The sources of all major waste streams are as follows:

1. Vegetable washing
2. Meat thawing
3. Equipment wash-up
4. Refrigeration and freezing purposes

All wastes are discharged to the Elliott Street combined sewers.

Sampling and Analysis

It was not possible to obtain samples on February 28, therefore, results obtained on samples taken during the 1960 survey are given for information purposes. Since operations at this plant have not significantly changed since 1960, the waste characteristics are expected to be similar.

Source	BOD_5 ppm	Suspended Solids ppm	Volume Gallons
Chicken thaw tank	1,650	152	30
Spare rib soak tank	300	142	30
Bean sprout tank	10	12	30

DISCUSSION OF RESULTS

Based on the analytical results and the fact that the major portion of wastes is comprised of either uncontaminated cooling waters or relatively clean vegetable wash water, this plant apparently contibutes negligible loadings of BOD_5 and suspended solids to the municipal sanitary sewer system.

Furthermore, the operations at this plant are expected to be altered in the near future so that meat thawing operations (the only source of high BOD_5) will be eliminated. Therefore, liquid wastes from this plant should pose no serious problems to the municipal sanitary sewage system.

COCA-COLA LIMITED

This plant is located at 1650 Howard Avenue and produces Coca-Cola, Sprite, Fanta, Tab and Fresca soft drinks for local distribution.

DETAILS OF SURVEY

Personnel Interviewed

Mr. D. Steele	-	Manager
Mr. F. Sohocki	-	Plant Superintendent

Description of Plant Processes

Treated and carbonated water, sugar and coca-cola concentrates are added to bottles and mixed on an automatic bottling machine. The plant has a capacity of bottling one million cases per year.

Operating Data

Employees	-	65 (approximately)
Operation Schedule	-	7 hours/day
		5 days/week

Water Supply and Distribution

Source	-	Windsor Utilities Commission
Volume	-	40,000 gpd (approximately)

Distribution

Product Usage	8,000 gpd
Rinse and Wash Waters	30,000 gpd
Sanitary and Domestic	2,000 gpd
	40,000 gpd

Sources and Disposal of Liquid Wastes

Liquid wastes originate from the bottle washing operation with minor quantities from floor and truck washing. Running rinses are the major contributors.

The caustic cleaning solution (3.0 - 3.7% caustic) is divided among three tanks which are periodically emptied.

(i) 360 gallons dumped bi-weekly

(ii) 200 gallons dumped semi-annually

(iii) 200 gallons dumped every 4 months

No treatment was provided and all wastes, including domestic wastes, were discharged to the municipal combined sewer system.

Sampling and Analysis

A grab sample (sample #2) of the caustic cleaning solution (360 gallons dumped bi-weekly) was taken from the machine during operation, and another was taken from the running rinse (sample #1) after the caustic wash. The analytical results were as follows:

Sample Number	BOD_5	Solids			COD	pH
		Total	Susp.	Diss.		
1	4.4	472	10	462	8	7.4
2	3,900	61,298	8,596	52,702	8,720	11.8

All analyses except pH recorded in parts per million

CONCLUSIONS AND RECOMMENDATIONS

Based on the analytical results, the process wastes from this Company are suitable for discharge to the sanitary sewer.

The periodic batch dumps of alkaline cleaner would tend to have a detrimental effect on the sewer due to the high pH. It is recommended that the caustic solution be neutralized before discharge or be bled slowly (3-4 hours duration) to the sewer to permit adequate dilution by other rinse waters.

CRUSH BOTTLING COMPANY

The Crush Bottling Company operates a soft drink bottling plant at 456 Tecumseh Road West.

DETAILS OF SURVEY

This plant was visited on April 3, 1968.

Personnel Interviewed

Mr. R. Paquette - Plant Manager

Description of Plant Processes

Soft drinks(Orange Crush) are produced at this plant. The blending of syrups, bottle washing, carbonation and bottling of the drinks are accomplished in the conventional manner.

Operation and Production Data

Operation Schedule	- 8 hours/day
	5 days/week
Employees	- 8 (approximately)
Raw Materials	- alkali cleaners, syrups etc.
Production	- summer - 750 cases/day
	winter - 600 cases/day

Water Supply and Distribution

Source	- Municipal Supply
Volume (average over 1967)	- 10,000 gpd

Distribution

Sanitary and Domestic	200 gpd
Wash Water	7,000 "
Product Usage	1,500 "
Other Uses	1,300 "
	10,000 "

Water used for the bottled products is treated further with lime, then passed through carbon and sand filters.

Sources and Disposal of Liquid Wastes

At this plant the main source of liquid waste is the bottle washing operation. The bottles are passed through a 1,000 gallon tank of heated alkaline cleaner, a hot still rinse, and then are washed clean by jet sprays of cold water. The hot water rinse is dumped every night while the alkaline cleaner is dumped every two months.

When daily operations are completed at this plant, copious amounts of water are used to wash up the equipment and floors.

The sand filters are periodically back washed and this waste is combined with sanitary sewage and wash waters and discharged to a sanitary sewer on Tecumseh Road West.

Sampling and Analysis

No samples of the wastes from this plant were taken at the time of the survey. Based on analytical results of samples taken at similar establishments it is felt that wastes of this nature would be suitable for discharge to the sanitary sewers with the exception of the batch dumps of alkaline cleaners.

CONCLUSIONS

Particular importance should be made of the intermittent (every two months) discharges of the caustic cleaner solutions. This discharge would tend to have a detrimental effect on the sewers and should therefore be neutralized before discharge or be bled slowly to the sewer so as not to exceed municipal Sewer-Use By-Law limits for pH.

DAINTY FOODS LIMITED

The Dainty Foods Limited plant is located at 725 Broadway Street and is involved in the processing of raw rice and the manufacture of rice flour.

DETAILS OF SURVEY

This plant was visited on February 15, 1968 and samples of the wastes produced were obtained.

Personnel Interviewed

Mr. W. Cross - Plant Manager

Mr. C. LeClerc - Plant Engineer

Description of Plant Processes

This plant can be divided into two main processing areas.

1. Polishing or Cleaning Area:

A major portion of the rice received at this plant is polished with glucose in large rotary drums over a prolonged period. The clean raw rice is separated from the "meal" or the separated rice surface and packaged for shipping. The "meal" is sold as a by-product. A small quantity of raw rice is crushed in this section to form rice flour.

2. Cooking Area:

Raw rice is first soaked in metal containers for about one hour to remove non-settleable solids, then drained and cooked for a short period of time in cooking kettles. The contents of these kettles are drained and cooled in a special strainer-type vessel. The rice is then vacuum packed in sterilized cans, allowed to cool to room temperature, frozen and thawed out before packaging and shipping.

Operating and Production Data

Employees	-	44
Operating Schedule	-	8 hours/day
		5 days/week
Raw Materials	-	60 million pounds rice/year (approx)

Water Supply and Distribution

Source	-	Municipal Supply
Volume	-	7,500 gpd

Distribution

Sanitary and Domestic	1,000 gpd
Pump Cooling	1,500 "
Rice Washing	750 "
Rice Cooking	2,000 "
Rice Cooling	1,750 "
Other Uses	500 "
	7,500 gpd

Sources and Disposal of Liquid Wastes

All industrial wastes in this plant originate in the cooking area where batch dumps from the washers, cooler and cookers are allowed to drain through a floor screen to a sump. From this sump, the wastes flow to a metering chamber and then to a baffled tank before discharging into an 8-inch sewer.

Sanitary wastes are discharged along with the industrial wastes and cooling waters to a 27-inch sanitary sewer on Highway 18.

A connection to the City's water supply is available so that the wastes can be diluted (5 : 1) before entering the existing baffled tank.

Sampling and Analysis

Grab samples were taken on February 15 of the various batch dumps that comprise the total industrial waste flows. The analytical results are as follows:

Sample Number	BOD_5	Solids		BOD	COD	Phosphates as PO_4	pH
		Total	Susp.				
1	4,050	5,682	4,098	1,580	8,895	180	6.0
2	1,000	1,410	446	600	1,237	61	4.3
3	360	558	386	135	666	8.9	6.6

All results except pH reported in parts per million

Sample Description

1. - Cooker Batch Dump

2. - Washer Batch Dump

3. - Cooler Batch Dump

WASTE LOADINGS

The following waste loadings were calculated using the estimated waste volumes and the analytical results of the individual waste flows:

BOD_5	-	95 lbs/day
Suspended Solids	-	90 lbs/day
COD	-	200 lbs/day
Phosphates as PO_4	-	10 lbs/day
pH range	-	4.3 - 6.6

DISCUSSION OF FINDINGS

The final waste effluent from this plant to the sanitary sewer was not sampled at the time of this visit; however, samples of the individual flows making up the final effluent were taken so that the approximate concentrations of waste contaminants in the effluent could be ascertained using concentrations and volume ratios. On this basis, the following approximate concentrations were obtained:

BOD_5	-	2,100 ppm
Soluble BOD	-	600 "
Suspended Solids	-	2,000 "
COD	-	8,000 "
Phosphates as PO_4	-	150 "
Total Kjeldahl Nitrogen as N	-	30 "
pH range	-	4.3 - 6.6

Several of the above concentrations, notably the BOD_5 and suspended solids, are in excess of the limits outlined in the City of Windsor Sewer-Use By-Law. In addition, the pH range is somewhat low for discharge to a sanitary sewer. However, in view of the relatively small volume of the process wastes (4,500 gpd), wastes from this plant should not present a serious overloading problem at the proposed municipal sewage treatment plant. The existing dilution system in this plant should not be utilized, under any circumstances, to reduce the concentrations of the waste parameters to the By-Law limits.

CONCLUSIONS AND RECOMMENDATIONS

Wastes emanating from this plant exhibited higher concentrations of BOD_5 and suspended solids than those permitted under the City of Windsor Sewer-Use By-Law. However, due to the relatively small volumes involved it is felt that the wastes from this plant should not present serious overloading problems to the sanitary sewage system.

The loadings from this plant were calculated to be 95 lbs of BOD_5 and 90 lbs of suspended solids in a process waste flow of about 6,500 gallons per day. According to the BOD_5 loading, this represents a population equivalent of approximately 475 persons.

The system constructed for the dilution of the process wastes so that the quality of the plant effluent would comply with the City By-Law limits should not be used, as useful hydraulic capacity in the new municipal sewage system is of prime concern.

It may be necessary to install neutralization facilities if the pH limits outlined in the municipal Sewer-Use By-Law are to be met.

ESSEX PACKERS LIMITED

This plant is situated at 897 Mercer Street and is engaged in the slaughtering of hogs and cattle, meat dressing and sausage manufacturing operations.

DETAILS OF SURVEY

The Essex Packers plant was visited on February 26 and samples of the two effluents discharging to the combined municipal sewer were obtained on February 28, 1968 and again on May 10, 1968.

Personnel Interviewed

Mr. S. Stowe	-	Superintendent
Mr. B. Schatdemore	-	Industrial Engineer

Description of Plant Processes

The processes in this plant can best be described as a combination of a slaughtering and meat dressing operation. That is, the animals are killed and bled on the killing floor (cattle being stunned prior to killing). Carcasses are trimmed, washed and hung in cold storage or cooling rooms. The liver, hearts and kidneys are collected for chilling before being marketed, while the hides are removed from the animals and salted before being shipped to tanners or other hide processing plants. Paunch manure and various bones are removed as the final operation in the slaughterhouse.

In the dressing operation, the main operations are geared to the production of a saleable product. Thus, carcasses from the slaughterhouse are dressed and cleaned prior to storing. Operations in this section also include:

(a) The manufacture of sausages, which entails grinding and blending the meat with additives before being stuffed into natural or artificial casings.

(b) The rendering of edible fats from the dressing operations into lard and edible tallow.

Production and Operating Data

Employees	-	120
Operating Schedule	-	2 shifts/day (no killing at night)
		5 to 5 1/2 days/week
Production	-	300 hogs/day
		50 cattle/day

Water Supply and Distribution

Source	-	Municipal Supply
Volume (average over 1967)	-	125,000 gpd

Estimated Distribution

Sanitary and Domestic	3,000 gpd
Slaughterhouse	94,000 gpd*
Dressing Operation	23,000 gpd*
Other Uses (boiler etc.)	5,000 gpd
	125,000 gpd

* Assumed the slaughtering operation used 80% of process water usage and the dressing 20%

Sources and Disposal of Liquid Wastes

The wastes associated with the slaughtering include blood and wash water from the killing floor, cooling water from the cooling room, and waste water from the dressing and butchering operations. The latter source is directed

to a settling basin for grease recovery before being discharged to a sump along with the killing floor waste water and the cooling water. Paunch manure is sewered directly to a small sump in the yard which eventually leads into the slaughterhouse sump and then to a combined sewer on Mercer Street. Inedible portions of the animals are collected and sold to a rendering plant.

Waste waters in the packinghouse section include wash waters used for preparing the meat, liquid waste from the rendering cooker for the edible portions of the animals, and cleaning, soaking and rinsing waters in the manufacture of sausages. All wastes from this area are discharged to a settling basin then to the combined sewer on Mercer Street.

Sampling and Analysis

Composite samples of the two effluents to the combined sewer on Mercer Street were taken on May 9 and 10, 1968. The analytical results of these samples were:

Sample Number	BOD_5	Solids		pH	COD	Soluble BOD	Total Kjeldahl as N
		Total	Susp.				
1	1,350	1,764	144	6.9	2,200	640	240
2	370	2,272	176	6.3	640	240	14
3	3,400	5,270	1,370	6.5	7,500	1,440	520
4	1,700	3,530	982	9.5	3,600	820	43

All analyses except pH reported in parts per million

Sample Description

1. - Killing Room, Effluent During Hog Killing
2. - Kitchen Room, Effluent During Hog Killing
3. - Killing Room, Effluent During Cattle Killing
4. - Kitchen Room, Effluent During Cattle Killing

WASTE LOADINGS

The following daily waste loadings have been calculated using estimated waste volumes and the analytical results of the samples.

Type of Kill	Type of Operation	Volume* Gallons	BOD_5 lbs	Susp. Solids lbs	COD lbs
Cattle	Killing	27,500	940	375	2,050
Cattle	Kitchen	7,000	120	70	250
Hog	Killing	66,000	900	95	1,450
Hog	Kitchen	16,500	60	30	110
	Total	117,000	2,020	570	3,860

* The individual volumes were calculated from daily production figures and the fact that 2.5 hogs are equivalent to 1 bovine, see "Sewage and Industrial Wastes" Volume 33, April 1961. In the final analysis it was calculated that the hog kill operations in this plant utilised 2.4 times the amount of water used in the cattle kill operation.

DISCUSSION OF RESULTS

It is seen from the analytical results of the samples taken at this plant that BOD_5 concentrations in the effluents are in excess of the limits set out in the City of Windsor Sewer-Use By-Law. The Company has indicated that a programme will be initiated in the future to reduce the waste loading to the sewers. This programme will consist of:

(a) A full survey of the plant operations as they pertain to sources of wastes and waste disposal.

(b) The installation of a cooker to take the inedibles which are presently trucked out for processing.

(c) The installation of a blood dryer to handle the blood now being sewered which would effectively reduce the BOD_5 loading by some 7%.

Other measures which may prove helpful in the reduction of the BOD_5 concentration should also be considered. One such method is the removal of solids from the wastes. Since the soluble BOD_5 is approximately one-half of the total BOD_5, one would expect a substantial decrease in the BOD_5 content with effective solids removal. Another measure is the installation of efficient grease traps to remove the fat content, and therefore some organic loadings, from the waste stream. Unfortunately, ether solubles or fat content readings on the samples were not obtained, but one could expect these concentrations to be in the order of 200 - 400 parts per million, which are well above the desired concentrations. Paunch manure and hog-stomach contents should be collected and disposed of separately instead of directly to the municipal sewers.

CONCLUSIONS AND RECOMMENDATIONS

Waste waters presently discharged from this plant to the municipal sewers are substantially in excess of the City of Windsor Sewer-Use By-Law limits on a number of counts. The daily waste loading from the slaughtering and meat dressing operations in this plant was 2,020 lbs BOD_5, or a population equivalent of 10,100 persons.

It is recommended that the Company initiate remedial steps to reduce the waste loading to the sewers. First, the programme indicated by the Company representatives should be completed. Then, other means of reducing the BOD_5

and ether soluble or fat content should be explored by the Company. These could include better solid waste segregation, solids removal (preferably with a vibrating screen), installation of grease traps and the judicious usage of water in the plant. If these measures fail to produce an acceptable effluent then the only alternatives facing the Company would be to install more elaborate waste treatment facilities or to enter into agreement with the City for the discharge of these waste waters into the municipal sewers.

Since the time of the survey the OWRC has been advised that this plant has ceased operations.

JAY-ZEE FOOD PRODUCTS LIMITED

This plant is located at 1030 Walker Road and is engaged in the production of the "Home Juice" brand fruit drinks.

DETAILS OF SURVEY

This plant was visited on March 1, 1968 and a sample of the plant effluent obtained.

Personnel Interviewed

Mr. M. DeMers - Plant Engineer

Description of Plant Processes

Fresh lemons, grapefruit and oranges are imported from the United States. The fruit is pre-soaked and fed into a large machine were the juice is extracted and the peeling and pits are shredded. The juice is then blended with sugar and other additives prior to the concentrating and bottling operations. The shredded peelings and pits are sluiced with water into the sewers.

The bottle cleaning line is made up of a rinse-soak-rinse cycle. The soaker solution is replenished periodically.

Operating Data

Employees - 34

Operating Schedule - 8 hours/day
5 days/week

Water Supply and Distribution

All water is obtained from the Windsor Utilities Commission. The daily consumption varies from 30,000 gpd in the winter to 70,000 gpd in mid-summer. This water is used in various areas as outlined below:

(1)	Shredded peelings sluice	12,000 gpd
(2)	Fruit soaking	6,000 gpd (average)
(3)	Bottle washing line	
(4)	Water used in products	
(5)	Equipment wash-ups	
(6)	Refrigeration and compressor cooling	35,000 gpd (average)
(7)	Sanitary	1,000 gpd
		54,000 gpd

Monthly figures for 1967 indicate that between 60% and 75% of the total water supplied is used for refrigeration purposes.

Sources and Disposal of Liquid Wastes

All liquid wastes are discharged to the Walker Road combined sewer. The sources of these wastes in order of magnitude are:

- cooling water used in the refrigeration equipment
- wash-down of shredded peelings from the juice extractor
- bottle washer-rinse overflow
- sanitary and domestic sewage.

Sampling and Analysis

Grab samples were obtained of the effluent from the peeling shredder machine and from the final rinse on the bottle washer unit. The analytical results, as determined at the OWRC Toronto Laboratory, are as follows:

Source	BOD_5	Solids		pH
		Total	Susp.	
Juice Extractor Drain (Peeling Shredder)	4,300	5,502	1,704	4.4
Rinse Water Overflow (Bottle Washing)	3.4	168	6	8.4

All analyses except pH reported in parts per million

WASTE LOADINGS

The total waste loadings (BOD_5 and Solids) from this plant originate essentially from the sluicing of the shredded peel, and from the equipment wash-up and bottle washing operations. The latter is considered to be about 10% of the former, and since only samples of the former were taken, the waste loadings from this section will be scaled up appropriately to give a more realistic total waste loading figure.

The loading from the sluicing of the shredded peels, based on a flow of 12,000 gpd and waste concentrations of 4,300 ppm BOD_5 and 1,704 ppm suspended solids, were calculated as: 520 lbs/day and 205 lbs/day respectively. This would mean that the total daily loadings from this plant were in the range of 575 lbs BOD_5 and 225 lbs suspended solids.

DISCUSSION OF FINDINGS

A grab sample of the rinse water overflow revealed the waste to be acceptable for direct discharge to a storm sewer providing such results were representative of continuous conditions. The sample of the sluicing waste, however, revealed BOD_5 and suspended solids concentrations far in excess of the limits prescribed in the City of Windsor Sewer-Use By-Law for wastes discharging to municipal sewers. Even after dilution with the rest of the plant wastes, BOD_5 concentration would not comply with the City's regulations. The pH value was also below the minimum value of 5.5.

CONCLUSIONS AND RECOMMENDATIONS

It was found from the OWRC visit to the Jay-Zee Food Products Limited plant in Windsor that concentrations of contaminants in the total plant effluent

discharging to the municipal combined sewer, were in excess of the City's By-Law limits. This is taking into consideration the dilution of the main contaminated waste streams - the sluicing of the shredded peels, equipment and bottle washings - with other uncontaminated waste streams. The BOD_5 and suspended solids in the sluice stream was found to be 4,300 ppm and 1,704 ppm respectively.

In order to comply with By-Law regulations, remedial steps should be taken to reduce the quantity of suspended solids and BOD_5 presently being sewered. Since the major portion of the pollution originates from the sluicing area, the installation of a screening device to treat this flow would reduce the solids and consequently the BOD_5 concentrations. This device should be of the vibrating type in order to facilitate the removal of solids for land disposal at an appropriate site.

KRUNCHEE POTATO CHIP COMPANY

The Krunchee Potato Chip Company, a Division of Sunshine Biscuits (Canada) Limited, is located at 3255 Wyandotte Street East.

DETAILS OF SURVEY

This plant was visited on May 10, 1968 and a sample of the effluent obtained.

Personnel Interviewed

Mr. R. Rafuse	- General Manager
Mr. E. Poirier	- Production Manager

Description of Plant Processes

Potatoes are fed into a large hopper from which they are dumped, as required, into a rotary peeler. Water is continuously fed into the peeler to act as a lubricant and a transportation medium. The peeled potatoes are then "washed" into the slicer where more water is added and the potatoes cut into thin slices. These slices enter the cooking vat, cooked in peanut oil, drained, salted, inspected and finally packaged.

Operating Data

Employees	- 35
Operating Schedule	- 8 hours/day

Water Supply and Distribution

Source	- Windsor Utilities Commission
Volume (average over 1967)	- 25,000 gpd

Distribution

Process	24,000 gpd
Sanitary	1,000 gpd
	25,000 gpd

Sources of Liquid Wastes and Disposal

The largest volume of contaminated wastes arises from water flowing away from the belt which transports the potatoes through the various processing stages. All wastes are collected in a large collection sump. The wastes are then pumped to a vibrating "Sweco" screen and the filtrate is directed to a sewer on Wyandotte Street. The solids that are retained contain peelings and earth, which have been removed from the potato through the various mechanical processing steps. The solid wastes are land-dumped.

All sanitary wastes are discharged via a separate sewer to the municipal sanitary sewer system.

Sampling and Analysis

Grab samples were obtained of wastes entering the "Sweco" screen and wastes discharging from the screen to the sewer. Analysis of the samples was performed at the Commission's Toronto Laboratory. The analytical results of samples taken at this plant are:

Sample Number	BOD_5	Soluble BOD	Solids		COD	pH
			Total	Susp.		
1	560	380	1,182	602	1,310	5.3
2	520	380	644	398	1,200	5.2

All analyses except pH reported in parts per million

Sample Description

1. - Wastes before screening

2. - Wastes after screening

WASTE LOADINGS

Based on an average daily flow of 24,000 gpd of process wastes and the analytical results of the sample of wastes leaving the vibrating screen, the waste loadings from this plant on May 10, 1968 were as follows:

BOD_5	- 125 lbs/day
Suspended Solids	- 96 lbs/day
COD	- 290 lbs/day
pH	- 5.2

DISCUSSION OF FINDINGS

Based on the analytical results of the two samples, it would appear that the "Sweco" vibrating screen is removing approximately 45% of the suspended solids from the process wastes and only 7% of the BOD_5 content.

The BOD_5 concentration of 520 ppm was slightly in excess of the City of Windsor By-Law limit of 500 ppm and, no doubt, with a finer mesh screen this concentration could be lowered to comply with the City's regulations

CONCLUSIONS AND RECOMMENDATIONS

The quality of wastes from this industry slightly exceeds the City By-Law limit in terms of the BOD_5 concentration and the pH is lower than the minimum specified. In order to lower the BOD_5 concentration it is recommended that the use of a finer mesh screen in the "Sweco" unit be investigated.

The BOD_5 loading was calculated to be 125 lbs/day or equivalent to a population of about 600 people.

MANNINA CHEESE MANUFACTURING

This plant, located at 1555 Crawford Avenue, manufactures mozzarella and other Italian cheeses.

DETAILS OF SURVEY

This plant was visited on April 1, 1967.

Personnel Interviewed

Mr. A. Mannina - Owner

Description of Plant Processes

Milk is received in tank truck, weighed, centrifuged for cream separation and then pasteurized. Following this, the separated milk is run into a 10,000 gallon vat, where the appropriate quantities of cream, rennet and/or starter are added to form the desired cheese product. The product of the cheese-making operation is stored in a water-filled vat overnight and then "pulled" or "stretched" the following morning in a special machine so that the finished product is more suited for its use in pizza-making. The cheese is again kept in a water-filled vat for an additional period prior to storage.

Operating and Production Data

Employees	- 2
Operating Schedule	- 6 to 8 hours/day 4 to 5 days/week
Raw Material	- 30,000 - 40,000 lbs of milk/week
Products	- Mozzarella cheese and three other Italian cheeses.

Water Supply and Distribution

Source - Municipal Supply

Volume
(average over 1967) - 2,500 gpd

Distribution

Domestic and Sanitary	50 gpd
Wash Waters	450 gpd
Cooling Vat Waters	1,400 gpd
Cooling Water	500 gpd
Other Uses	100 gpd
	2,500 gpd

Sources of Liquid Wastes and Disposal

As in any cheese making operation, the major sources of wastes stem from the washing of equipment and floors, cooling operations in the storage room, dumping of holding vats, dumping of whey, etc. These wastes are discharged to the sanitary sewers on Crawford Street.

WASTE LOADINGS

During this visit, no samples of the waste effluent were taken because of the intermittent operations associated with this type of industry. However, an approximate waste loading from this plant can be obtained by using waste data found in the literature[1] references on dairy wastes and also from previous experience with similar cheese making industries.

1 An Industrial Waste Guide to the Milk Processing Industry, U.S.P.H. publication.

Assuming this plant processes 4 vats or 40,000 lbs of milk every five days, the predicted waste loadings from this plant are:

BOD_5	- 330 lbs/day
Suspended Solids	- 30 lbs/day
pH	- 6.0 to 6.6

CONCLUSIONS AND RECOMMENDATIONS

This plant produces a waste very typical of the dairy industry - highly organic in nature and consisting mainly of batch discharges or "dumps". Despite the relatively high BOD_5 concentrations and loadings, which may exceed the limits set out in the City of Windsor Sewer-Use By-Law, the dairy wastes from this plant should not cause undue problems at the sewage treatment plant. If, at any time, however, a reduction in waste loadings from this plant to the sewer system is necessitated, the cessation of whey dumping, which constitutes in excess of 80% of the BOD_5 waste loading should be considered.

PURITY DAIRIES

Purity Dairies, located at 1501 Howard Avenue, manufactures whole and skim milk as well as ice-cream.

DETAILS OF SURVEY

This plant was visited on February 28, 1968.

Personnel Interviewed

Mr. T. Mansell - Plant Superintendent

Description of Plant Processes

All milk is received via tank truck and is processed in the conventional manner using pasteurization and homogenization techniques.

Operating Data

Operation Schedule - 8 hours/day
5 days/week (7 days for milk receiving)

Employees - 60

Milk Intake - 160,000 lbs milk/day (average)

Water Supply and Distribution

Source - Windsor Utilities Commission

Volume (gpd)	Maximum	Minimum	Average
	165,000 (using 1967 figures)	90,000	127,000
Distribution			
Sanitary	1,200	1,200	1,200
Process (cooling, bottle washing, etc.)	163,800	88,800	125,800

Sources of Liquid Wastes and Disposal

The main source of contaminated liquid wastes originates from the bottle washing operation. All bottles are passed through a detergent soaker then rinsed with a continuous spray of clean water. The soaker is dumped every three months and washed down. The manufacture of ice-cream is a dry operation except for the wash-up of equipment at the end of the shift.

The main volume of water used in the plant is solely for cooling and refrigeration purposes. It does not come in contact with the milk and as a result is discharged as clean water.

All wastes are discharged to the Howard Street combined sewer.

Sampling and Analysis

The accuracy of any samples taken at dairy operations in a short period of time is open to question because of the widely fluctuating flow patterns and the waste characteristics. No samples were taken at this plant, but for the purpose of this survey, projected waste loadings based on milk intake figures are presented.

WASTE LOADINGS

Process	lbs BOD_5 per 10,000 lbs Milk Intake	Actual BOD_5 based on 160,000 lbs (average)
Receiving and Cooling	4	64
Tank Truck Delivery and Washing	1	16
Storage	.5	8
Cream Separation	4	64
Milk Pasteurization	8	128
Ice-Cream Making (5% of intake)	4	5
		285

The data for the table on the previous page were taken from "An Industrial Waste Guide to the Milk Processing Industry" - a United States Public Health publication.

The theoretical maximum and minimum projected waste loadings based on milk intake figures are 360 lbs/day and 215 lbs/day respectively.

DISCUSSION OF FINDINGS

Wastes from this dairy should not have a detrimental effect on the operation of the municipal sewage treatment plant. It is recommended, however, that precautions be taken to prevent batch dumping of milk and/or caustic cleaning solutions, two occurrences which could cause serious over-loading or other problems at the municipal sewage plant.

The average waste loading from this industry was calculated to be 285 lbs BOD_5/day or equivalent to the sewage contributed by 1,425 persons.

SEVEN-UP BOTTLING COMPANY (WINDSOR) LIMITED

This plant, located at 970 Mercer Street, bottles ginger-ale and Hires root beer for Vernor's Ginger Ale Limited.

DETAILS OF SURVEY

Personnel Interviewed

Mr. A. F. Valente - President

Description of Plant Processes

The manufacturing operations in this plant consist of the mixing and preparation of concentrated syrups, the dilution of this syrup with pre-treated city water in a bottling operation, followed by carbonation and capping. The bottles are washed in a bottle washing machine before being used in the bottling operation.

Operating Data

Employees - 28

Operating Schedule - 8 hours/day
5 days/week
Bottling operations usually ran 5 hours/day, 3 - 5 days/week

Water Supply and Distribution

Source	- Windsor Utilities Commission
Volume (average over 1967)	- 13,000 gpd (approximately)

Distribution

Product Usage	2,500 gpd
Rinse and Wash Waters	10,000 gpd
Sanitary and Domestic	500 gpd
	13,000 gpd

Sources of Liquid Wastes and Disposal

Industrial wastes originate in the bottling operations. The bottles receive an initial water rinse to remove any foreign matter that might be left as a residue in the bottles. The bottles are then soaked in 3.5% caustic solution and twice water rinsed. A portion of the second water rinse is re-used in the initial rinsing. These pre-rinse waste waters are passed through a screen prior to discharge to the municipal combined sewer. The final rinse flows directly to the sewer.

Every three or four months the tank bearing the caustic solution is cleaned. This operation entailed the reclaiming of approximately one-half to one-third of the solution, dumping the remainder to the sewer, and disposing of the sludge at the City's land disposal site. Once each year the entire solutions are dumped and completely renewed.

Other wastes are sanitary wastes and truck washings. All wastes are discharged to the combined sewer system on Mercer Street.

Sampling and Analysis

Grab samples were taken of:

1. The pre-rinse, after screening, prior to discharge.
2. The caustic wash solution.
3. The caustic rinse waters from the tank near the overflow to the sewer.

The analytical results of these samples are as follows:

Sample Number	BOD_5	Solids		COD	pH
		Total	Susp.		
1	86	358	6	125	7.0
2	8,300	42,016	174	12,350	11.8
3	1.3	214	9	4	7.0

All analyses except pH reported in parts per million.

CONCLUSIONS AND RECOMMENDATIONS

The analytical results of samples taken at this plant indicate that the normal plant effluent is suitable for discharge to the municipal combined sewer system. This is based on a comparison of the effluent

characteristics with the limits set out in the City of Windsor Sewer-Use By-Law. However, as the periodic batch dumps of alkaline cleaner would tend to have a detrimental effect on the sewer because of the high pH, it is recommended that the contents of these tanks be neutralized or bled slowly to the sewer to obtain adequate dilution by other rinse waters.

SILVERWOODS DAIRY

Silverwoods Dairy is located on Huron Line Road in the south western outskirts of Windsor. This dairy processes whole and skim milk, cottage cheese, buttermilk, and breakfast drink concentrates.

DETAILS OF SURVEY

This plant was visited on February 28, 1968.

Personnel Interviewed

Mr. S. Weaver - Plant Foreman

Description of Plant Processes

Milk is brought to the plant in cans and by bulk tankers and is processed into the various dairy products using conventional methods. The manufacture of breakfast drink concentrates is a dry blending operation.

Operating and Production Data

Operating Schedule - 8 - 9 hours/day
5 days/week

Employees - 125

Milk Intake - 200,000 lbs milk/day (maximum)
150,000 lbs milk/day (minimum)
175,000 lbs milk/day (average)

Water Supply and Distribution

Source - Windsor Utilities Commission

	Maximum	Minimum	Average
Volume (gpd)	150,000	80,000	115,000

(taken from 1967 figures)

Distribution (gpd)	Maximum	Minimum	Average
Sanitary	2,500	2,500	2,500
Process (cooling bottle washing etc.)	147,500	77,500	112,500

Sources of Liquid Wastes and Disposal

The main contaminated liquid wastes from this plant are:

- tank truck and milk can wash waters
- equipment wash waters
- sanitary wastes.

Pasteurization and associated cooling waters (by far the largest waste flow) are retained in a closed recirculation system, with a minor bleed-off to the sewers.

When a vat of cottage cheese is made approximately 3,000 lbs of whey by-product is sewered. Cheese is made on a varying schedule, solely dependent upon the demand for the product.

The contents of the bottle soaker are dumped every six months.

All liquid wastes are discharged to a municipal lagoon which serves the Ambassador Drive Industrial Park area. The overflow from the lagoon is discharged to the Grand Marais Drain which eventually flows to the Detroit River.

Sampling and Analysis

No samples were taken at this plant, since representative samples of the waste effluent from this type of industry are difficult to obtain over a short period of time. This is due to the fluctuating waste flows and concentrations that exist from hour to hour or day to day in any dairy operation. Instead, projected waste loadings based on the milk intake figures will be calculated for the purpose of this report.

WASTE LOADINGS

Process	lbs BOD_5 per 10,000 lbs Milk Received	Actual BOD_5 based on 175,000 lbs Milk Received/day
Receiving and cooling	4	70
Tank truck delivery	1	17.5
Storage	0.5	8.5
Cream separating and pasteurization	4	70
Milk pasteurization etc.	8	140
Cottage cheese mfg. (5% of intake)	16	15
Butter milk mfg. (5% of intake)	12	10
		330

The projected maximum and minimum BOD_5 waste loadings from this plant, based on milk intake figures, are 400 lbs/day and 300 lbs/day respectively and these would occur in mid-summer and mid-winter. These figures will be augmented by the dumping of whey from the cottage cheese process. Assuming this occurs once per week, about 200 lbs/day average BOD_5 will be added to the normal waste loading

DISCUSSION OF FINDINGS

Under normal operating conditions this dairy sewers wastes with a BOD_5 population equivalent of 1,800 persons. Moreover, each batch discharge of whey represents an additional BOD_5 loading of 1,100 lbs or 6,600 persons. As a result, measures should be investigated to prevent these batch dumps of whey from reaching the sewage system. Land disposal of such wastes may be an acceptable and practical solution to the problem. Similarly, an alternative

method should be found for handling periodic discharges of the high pH caustic cleaners.

CONCLUSIONS AND RECOMMENDATIONS

The normal discharge from this plant appears to be acceptable for treatment at the municipal sewage plant. An alternative means for disposing of the whey by-product from the manufacture of cottage cheese and the alkaline cleaners should be investigated.

The theoretical average waste loading from this plant was calculated to be 330 lbs BOD_5 per day. However, this total is augmented by an average loading of 200 lbs BOD_5 per day from the dumping of whey or an increase of 60% in the BOD_5 loading. The population equivalent based on a BOD_5 loading of 530 lbs is 2,650 persons.

TWIN PINES DAIRY

Twin Pines Dairy, located at 636 Aylmer Road, produces bottled milk, cottage cheese, and ice-cream only.

DETAILS OF SURVEY

This plant was visited on February 29, 1968.

Personnel Interviewed

Mr. S. Cohen - Plant Manager

Description of Plant Processes

Whole milk is received at the plant via bulk tank truck. After separating, the milk is pasteurized, cooled and bottled.

Cottage cheese is made on an intermittent basis. A vat of milk yielding 200 lbs of cheese also results in the formation of approximately 1,000 lbs of whey which is eventually sewered.

The manufacture of ice-cream mix is a dry blending process.

Operating Data

Operating Schedule - 8 to 9 hours/day
5 days/week

Employees - 24

Water Supply and Distribution

Source - Windsor Utilities Commission

Volume (gpd)	Maximum	Minimum	Average
	34,000	17,000	25,500

(average over 1967)

Distribution (gpd)	Maximum	Minimum
Sanitary	500	500
Process	13,500	9,700
Cooling	20,000	6,800
	34,000	17,000

Sources of Liquid Wastes and Disposal

There are three types of liquid wastes from this plant. The first, and largest in volume, includes water used during pasteurization and for equipment cooling purposes. The second is made up of wastes from the cleaning and rinsing of milk bottles and periodic equipment washing. There are also periodic batch discharges of whey from the cottage cheese production.

The first flow is essentially uncontaminated. The water is enclosed in cooling jackets and does not come in contact with any product or raw material.

All liquid wastes including sanitary wastes are discharged to a combined sewer on Argyle Street.

WASTE LOADINGS

Process	lbs BOD_5 per 10,000 lbs of Milk Received	Actual Waste Loadings Based on 25,000 lbs
Receiving and Cooling Milk	4	10
Tank Truck Delivery Wash-Up	1	2.5
Storage of Fluid Milk	0.5	1
Milk Pasteurization, Bottling and Cooling	7	17.5
Ice-Cream-Mix Making (5% of intake)	4	1
Cottage Cheese Making (15% of intake)	16	6
		38

The data for the table presented above were taken from "An Industrial Wastes Guide to the Milk Processing Industry" - United States Public Health publication.

The theoretical average BOD_5 waste loading based on 25,000 lbs of milk being received is 38 lbs/day.

The projected maximum and minimum BOD_5 waste loadings from this plant are 52 lbs/day and 26 lbs/day respectively. These loadings figures were based on water supply figures rather than milk intake figures as the latter figures were not available.

The dumping of whey to the sewers adds to the normal daily loadings. Assuming that one batch of whey is dumped per week, 1,100 lbs BOD_5 or 220 lbs per day is added to the sewers.

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

Wastes from the normal daily operations at this plant should not pose an operational problem to the new sewerage system. However, the batch dumpings of whey from the cottage cheese operation and caustic cleaners from the bottle washing operations may create problems. Neutralization of the caustic cleaners and alternate disposal of whey should be considered.

The average BOD_5 waste loading, including the batch dumps, from this plant is estimated at 258 lbs per day or a population equivalent of 1,290 persons. Of this total 85% or 220 lbs BOD_5 results from the whey dump, and, if at any time, a reduction in BOD_5 loadings is desired the elimination of the whey dump should be considered first.

WINDSOR PACKING COMPANY LIMITED

The Windsor Packing Company Limited operates a slaughter and meat packing house on Tecumseh Boulevard West in Windsor.

DETAILS OF SURVEY

This plant was visited on March 21 and 22, 1968 and samples of the plant's effluent taken.

Personnel Interviewed

Mr. V. Hackett - Plant Engineer

Mr. B. Pazner - Plant Superintendent

Description of Plant Processes

Processes at this plant include slaughtering of the animals, meat dressing, sausage-making, cooking of hog's blood and rendering of edibles to lard.

The animals are killed and bled on the killing floor (cattle being stunned before killing). The blood from the hogs is retained for cooking into a saleable product. The carcasses are trimmed, washed and hung in cold storage or cooling rooms. The liver, hearts and kidneys are collected for chilling before being marketed, while the hides are removed from the animals and salted before being shipped to tanners or other hide processing plants. Paunch manure and various bones are removed as the final operation in the slaughterhouse.

In the dressing operation, the main operations are geared to the production of a saleable product. Thus, carcasses from the slaughterhouse are dressed and cleaned prior to storing. Operationsin this section also include:

(a) the manufacture of sausages, which entails grinding and blending of the meat with additives before being stuffed into natural or artificial casings; and

(b) the rendering of edible fats from the dressing operations into lard and edible tallow.

Operating and Production Data

Operating Schedule	-	8 hours/day
		5 days/week
Employees	-	125 (approximately)
Production (average)	-	350 hogs/day
		100 cattle/day

Water Supply and Distribution

Source*	-	Municipal Supply
Volume (average over 1967)	-	180,000 gpd

Distribution

Sanitary and Domestic	2,500 gpd
Processing (Killing and Dressing)	145,000 gpd
Other Uses (Cooling Boiler etc.)	32,500 gpd
	180,000 gpd

* It should be noted that the Company's well supply is no longer used.

Sources of Liquid Wastes and Disposal

Process wastes, resulting from the washing of carcasses, floors, equipment, etc., are discharged to a settling tank with a capacity of about 3,000 gallons. The accumulated solids are removed manually throughout the day and stored in containers. The effluent from this tank is discharged to the municipal sanitary sewer system.

Blood from the hog slaughtering platform is drained to a cooking unit. The blood resulting from the beef slaughtering operations is discharged along with other process wastes to the settling tank.

Some solids are rendered to edible lard and tallow. Other solids (mostly inedible) are removed to a rendering plant.

Cooling water from certain areas is discharged to the municipal sewer system, while a large volume is reused in the plant.

Domestic sewage is discharged to the municipal sanitary sewers.

Sampling and Analysis

The following composite samples were obtained:

(a) March 21, 1968 during the hog processing operations. An attempt was made to obtain samples over a 3-hour period but operations were terminated early.

(b) March 22, 1968 during the beef processing operations. Sampling was carried on over a 3-hour period.

The analytical results of the composite samples are presented below:

Sample Number	BOD_5	Solids Total	Solids Susp.	pH	Ether Solubles
1	2,700	1,848	530	6.4	381
2	2,650	3,166	1,640	6.4	381
3	3,000	1,910	502	6.7	142
4	4,900	4,296	968	6.4	241

All analyses except pH reported in parts per million

Sample Description

1. - Influent to Settling Basin during Hog Killing
2. - Effluent from Settling Basin during Hog Killing
3. - Influent to Settling Basin during Cattle Killing
4. - Effluent from Settling Basin during Cattle Killing

WASTE LOADINGS

	Source	Date	Flow gpd	BOD_5 ppm	lbs/ day	Susp. Solids ppm	lbs/day
(1)	Process Wastes (Hog Processing)	Mar. 21/68	86,000*	2,700	2,320	530	456
(2)	Settling Tank Effluent to Sewers(Hog Processing)	"	86,000*	2,650	2,280	1,640	1,410
(3)	Process Wastes (Cattle Processing)	Mar. 22/68	59,000*	3,000	1,770	502	296
(4)	Settling Tank Effluent to Sewers (Cattle Processing)	"	59,000*	4,900	2,890	968	1,980
(5)	Daily Settling Tank Effluent to Sewers ((2) and (4))	"	145,000		5,170		1,980

* Individual waste flows were estimated on the basis of production figures and the fact that the volume of water used to process 1 bovine is equivalent to that used to process 2.5 hogs (see "Sewage and Industrial Wastes" Volume 33, April 1961). This means that the amount of water used in hog processing in this plant is about 1.5 times that used in cattle processing.

DISCUSSION OF FINDINGS

The analytical results reveal that exceptionally strong wastes are being discharged to the sanitary sewer system from this plant. The concentrations of BOD_5, suspended solids and ether solubles (grease or fat) are far in excess of the City of Windsor prescribed limits for discharge to a sanitary sewer.

Laboratory results indicate that the suspended solids increased considerably following retention in the wastes settling tank, which whould suggest the accumulated solids are not properly skimmed and removed from this tank. This tank is employed to retain heavy solids which are taken away manually, and later hauled to a fertilizer plant. It is understood that a mechanical screening unit is to be installed in the near future. However, it is doubtful that this action can bring about a reduction in BOD_5 concentrations to comply with City regulations.

Blood from the hog slaughtering operations is diverted to a cooking unit. Company officials advised that beef blood would also be disposed of in a similar manner as soon as a second unit can be placed in operation. About a 7% BOD_5 reduction in this source of wastes can be achieved by this measure. The higher BOD_5 evident during the beef slaughtering operation could probably be attributed, to some degree, to blood being discharged along with the process wastes.

It was not believed that the waste volume could be reduced further since "water-saver" nozzles are being used on all washing hoses.

CONCLUSIONS AND RECOMMENDATIONS

The sampling programmes conducted at this meat processing plant on March 21 and 22, 1968 revealed that exceptionally strong wastes were being discharged to the municipal sanitary sewer system:- 5,170 lbs BOD_5/day and 1,980 lbs suspended solids/day in 145,000 gallons/day of process wastes. The population equivalent based on the BOD_5, is approximately 25,850 persons.

Further efforts should be made to reduce the BOD_5 and grease loadings discharged to the municipal sewers.

It is recommended that:

(a) Mechanical screening of process wastes be provided at the earliest possible date.

(b) All blood wastes be separated and disposed of by drying or by some other satisfactory means.

(c) The Company install more efficient grease traps.

(d) Further sampling be conducted at a later date when mechanical screening and separation of all blood wastes has been provided, to determine whether this change has rendered the quality of the wastes acceptable for discharge to a sanitary sewer. If these measures prove unsuccessful then the Company would have no alternative but to install biological treatment or enter into agreement with the City for the acceptance of these waste waters into the municipal sewers.

HIRAM WALKER AND SONS LIMITED

Hiram Walker and Sons Limited operates a distillery complex for the production of grain spirits at 2072 Riverside Drive East in Windsor.

This industry was not visited during this municipal survey of the industries in the City of Windsor. The Company had recently carried out extensive in-plant studies to identify sources, volume and strengths of industrial wastes, and was in the process of segregating the sewers containing high strength wastes so that they could ultimately be diverted, with the City's approval, to the municipal sanitary sewer system. The uncontaminated wastes will be discharged, as at present, to the Detroit River.

Once these changes are completed (January, 1970) the industry anticipates a 90% reduction in BOD_5 loading and a 10% reduction in the waste flow to the Detroit River. At the time of the municipal survey, approximately 13,000 lbs BOD_5 in a waste flow of 8.2 mg were being discharged to the River daily. The anticipated BOD_5 concentration in the wastes to be discharged to the River after the high strength wastes have been segregated is 23 ppm which closely approximates the OWRC objective of 15 ppm for a discharge to a watercourse.

For the purpose of this municipal survey, information on the OWRC files for this plant will be summarized.

Officers of the Company

Mr. W. H. Arison	-	Production Manager
Mr. M. Sobolov	-	Plant Bacteriologist

Operating Data

Operating Schedule	- 1 to 3 shift/day
	5 to 6 days/week
Employees	- 1,100

Description of Plant Processes

The process consists of milling, cooking and fermenting of grain, followed by distillation to produce the alcohol. The slop or still bottoms is taken to the cereal products building for dewatering and drying to produce distillers grain. The alcohol is cooled and blended to produce whiskey or distilled with additives to form gin.

Water Supply and Distribution

Source	- Detroit River (industrial water)
	- Municipal Supply (domestic and other uses)
Volume*	- 8,200,000 gpd (industrial)
	- 280,000 gpd (domestic and other uses)

Distribution

Domestic and Sanitary Usage	25,000 gpd
Industrial Usage (estimate)	1,455,000 gpd
Cooling (estimate)	7,000,000 gpd
	8,480,000 gpd

*The water consumption figures are up-dated to 1968

Sources of Liquid Wastes and Disposal

Waste waters originating in the processes, such as cooling waters from coolers and barometric condensers, equipment and floor wash-ups, boiler blowdown and softener backwash, and filter effluents, are presently discharged to the Detroit River via a combination of sewers.

Domestic and sanitary wastes are directed to the municipal system.

WASTE LOADINGS

Based on data supplied by the Company, the daily waste loadings are as follows:

BOD_5	- 13,000 lbs
Suspended Solids	- 8,300 lbs
pH range	- 7.2 to 9.1

Once the segregation of the high strength wastes is completed, the estimated daily waste loadings discharged directly to the Detroit River will be:

Volume	- 7.4 mg
BOD_5	- 1,700 lbs

DISCUSSION OF FINDINGS

The 1965 OWRC survey on this industry's waste disposal practices indicated that the quality of wastes from this plant did not meet OWRC objectives for direct discharge to an open watercourse. Since then the industry has undertaken certain steps to identify and segregate high strength waste flows with a view to diverting these flows to the municipal sanitary sewage system.

This change would result in the reduction of the BOD_5 loading and waste volume to the River from 13,000 lbs to 1,700 lbs and 8.2 mgd to 7.4 mgd respectively. The anticipated loadings to the municipal sewers are 11,300 lbs BOD_5 (population equivalent of 56,500) in a flow of 800,000 gallons per day.

The treatment of distillery wastes along with domestic wastes in a municipal treatment plant is practical. However, until the municipality provides some form of secondary treatment only marginal reductions in the waste loadings discharged to the Detroit River can be expected.

JOHN WYETH AND BROTHERS LIMITED

John Wyeth and Bros. Limited, located on Ottawa Street, manufactures general pharmaceuticals and reconstituted milk products as baby foods.

DETAILS OF SURVEY

This plant was visited on March 21, 1968 and samples of the various sources of wastes taken on April 17 and 18, 1968.

Personnel Interviewed

Mr. G. Gray	- President
Mr. J. W. Beverige	- Services Division
Mr. J. Russell	- Plant Engineer

Description of Plant Processes

S. M. A. powder is the main product manufactured in this plant. It is a reconstituted milk product for babies made to resemble mother's milk. The manufacturing process of this baby food entails the mixing, clarifying, homogenizing and drying of special fats and other additives. After drying, the powdered product is packaged and shipped.

Pharmaceuticals (mainly amphojel) are formulated batchwise in reaction tanks by the addition and mixing of the desired raw materials.

Operating Data

Employees	- 186
Operation Schedule	- 8 hours/day
	5 days/week
	S.M.A. powder is produced 3 days/week 24 hours/day

Water Supply and Distribution

Source - Windsor Utilities Commission

Volume (average over 1967) - 34,300 gpd

Distribution

Wash-up from Food Processing	1,000 gpd
Amphojel Washings (per vat)	3,300 gpd
Other (boiler and cooling water make-up, laboratory, floor washings, still usage)	23,000 gpd
Sanitary and Domestic	4,000 gpd
Other	2,000 gpd
	34,300 gpd

Sources of Liquid Wastes and Disposal

The baby food processing wastes are similar to dairy wastes in that they are produced during equipment washings. The volume of this flow was approximately 1,000 gallons per day.

Additional wastes are produced from the water washing of the amphojel formulation tanks. This washing process lasts from 8 to 16 hours per vat. Amphojel production was reduced to 16 weeks per year at which time only one to three vats were washed at once. Vats are washed at an approximate rate of 4 gpm per vat.

Other wastes were those from floor washings and sanitary and domestic wastes. All entered a combined sewer system without treatment.

Sampling and Analysis

Grab samples were taken of the wash waters from the S.M.A. and Amphojel formulation tanks on April 17 and 18, 1968.

The analytical results of these samples were:

Sample Number	BOD_5	Solids		pH	Ether Solubles
		Total	Susp.		
1	11,200	10,340	3,924	4.6	1,310
2	3.4	4,734	2	7.4	-

All analyses except pH reported in parts per million

Sample Description

1. - Wash Waters from S.M.A. Tank

2. - Amphojel Wash Waters

WASTE LOADINGS

These were calculated as follows:

BOD_5	-	115 lbs/day
Suspended Solids	-	45 lbs/day
Ether Solubles	-	14 lbs/day

DISCUSSION OF FINDINGS

The major wastes from this plant originate from the washing out of the S.M.A. formulation tank. The concentrations of BOD_5, suspended solids and ether solubles are high, but considering the dilution with other relatively uncontaminated wastes, excessive concentrations in the total plant effluent are not expected.

The waste loading from this plant is slightly higher than the 115 lbs BOD_5 calculated since floor wash-up waters were not sampled.

CONCLUSIONS AND RECOMMENDATIONS

The wastes from this plant should not present any problems to the municipal sewage system. The concentrations of BOD_5, ether solubles and suspended solids in the wash water from the S.M.A. formulation tank are high, but these are expected to be decreased by the dilution from other uncontaminated wastes. The BOD_5 waste loading from this plant was calculated to be 115 lbs which represents a population equivalent of 5,600 persons.

THE CANADIAN SALT COMPANY LIMITED

This plant is located at 30 Prospect Avenue and is engaged in the production of common salt by solution mining and evaporation.

DETAILS OF SURVEY

This plant was visited on November 21, 1967, and samples of the effluent to the Detroit River were taken on the same day.

Personnel Interviewed

Mr. H. Ayres	-	Works Manager
Mr. J. Eastwood	-	Plant Engineer

Description of Plant Process

Water is pumped from the Detroit River into the grid work of wells to dissolve the salt from the underground deposits. The saturated brine is pumped to the surface where it is divided into two streams, one of which is pumped to the United States and the other to the adjacent plant for evaporation and salt packaging.

In this plant the brine is fed to a triple effect evaporator where it is concentrated to a slurry of about 15-20% NaCl crystals by volume. The slurry is washed and filtered to remove the crystals from brine solution. Finally the crystals are dried prior to packaging.

Production and Operating Data

Number of Employees	-	175 (maximum)
Operating Schedule	-	24 hours/day
		5 days/week
Production Rate	-	20 to 25 tons of salt per day

Water Supply and Distribution

Source - Detroit River and City of Windsor

Volume - Detroit River - 3,600 to 5,800 gpm

- Municipal Supply - 40,000 gpd (1967 average)

Estimated Distribution:

Municipal Supply

Sanitary Usage	3,500 gpd
Scrubbing Waters	36,500 gpd
	40,000 gpd

River Supply

Mining Usage	1,600 gpm
Condenser Usage	3,100 gpm
	4,700 gpm

Sources of Liquid Wastes, Treatment and Disposal

The main sources of plant wastes can be summarized as follows:

1. Condensate from the evaporators.
2. Cooling water from the evaporator pans.
3. Overflow from the brine tank.
4. Scrubbing waters from dust collectors.
5. General spills and washings.
6. Sanitary sewage.

All of the plant wastes, with the exception of the sanitary sewage, are discharged to the Detroit River via two sewers. The wastes from the

barometric leg condenser on the evaporator and the condensate are discharged through a main sewer to a sump situated outside. The flow from this sump is controlled by a float controlled pump which pumps the contents to the Detroit River. Sanitary wastes are discharged to a septic tank and tile bed system.

Sampling and Analysis

Composite samples of the service water and the two waste streams to the Detroit River were taken on November 22, 1967. These samples were submitted to the OWRC laboratories for analysis. The analytical results of these samples were:

Sample Number	BOD_5	Solids		pH at Lab.	Chlorides as Cl	Sodium as Na	Sulphates as SO_4
		Total	Susp.				
1	3.2	820	46	8.2	325	190	70
2	5.6	1,670	132	8.4	4,631	2,515	540
3	6.8	292	42	8.7	57	16	23

All results except pH reported in parts per million

Sample Description

1. - Condenser Sewer to River
2. - Main Sewer to River
3. - Service Water to Plant

WASTE LOADINGS

Net waste loadings to the River based on calculations using the flow rates and the analytical results of the collected samples were as follows:

Suspended Solids - 390 lbs/day

Chlorides as Cl - 22,800 lbs/day

pH - 8.2 to 8.7 .

CONCLUSIONS AND RECOMMENDATIONS

The effluent in the main sewer was found to be unacceptable for discharge to a natural watercourse with respect to the suspended solids concentration which exceeded the Commission objectives of 15 ppm.

Waste loadings for suspended solids and chlorides in the waste flows to the Detroit River over a full day's operation were calculated to be in the neighbourhood of 400 pounds and 23,000 pounds respectively. It is recommended that strict in-plant control and good house-keeping practices be established to reduce losses to the sewer.

DUPLATE OF CANADA LIMITED

Duplate of Canada Limited is located at 1850 Walker Road and manufactures tempered and laminated glass for the automotive industry.

DETAILS OF SURVEY

This plant was visited on March 19, 1968 and the various effluents from the plant were sampled.

Personnel Interviewed

Mr. C. Ladham - Plant Engineer

Mr. C. Cada - Maintenance Foreman

Description of Plant Processes

Sheet glass is purchased from a subsidiary company and "worked" in one or two areas in the plant. These areas are:

(1) Tempered Glass Area

In this area, special glass is heat treated and air-cooled so that the outer surface is in a state of compression caused by the cooling operation. The surfaces are then ground and any necessary holes for vent locks etc. are drilled. The glass is then washed and readied for shipment.

(2) Laminated Glass Area

Two layers of thin plate glass are cleaned and a thin sheet of non-brittle plastic is placed between them. The "sandwich" is first subjected to moderate heat and then placed in an oil filled autoclave. Here high temperature and pressure are exerted to bring the interlayer into intimate contact. The windshields are then cooled by pumping the oil through

water cooled heat exchangers. Finally, the windshields are removed from the autoclave and washed down with a detergent-water solution to remove traces of oil. The windshields are then packaged and readied for shipment.

Operating Data

Number of Employees	-	200
Operating Schedule	-	5 days/week
		8 hours/day
		16 (occasionally if production demands it)

Water Supply and Distribution

Source	-	Windsor Utilities Commission
Volume	-	500,000 gpd (maximum)
		152,000 gpd (minimum)
		180,000 gpd (January 1968)

Distribution

Sanitary	4,000 gpd
Glass Washing	5,000 gpd
Cooling (heat exchangers compressors etc.)	171,000 gpd
	180,000 gpd

Sources of Liquid Wastes and Disposal

The main waste from this plant is uncontaminated cooling water used in the heat exchangers constituting approximately 95% of the total plant effluent.

The remaining 5% consists of wastes from detergent washing of the windshields, water used in grinding and washing of the tempered side glass, and sanitary wastes.

Each batch washing of windshields requires approximately 300 gallons of hot water and detergent solution. These wastes plus the autoclave cooling water are discharged to the Walker Road combined sewers via an interceptor sewer which crosses the front lawn of the plant.

Wastes from grinding, drilling and washing operations in the tempered glass area are discharged to a series of three settling basins. The overflow from these basins is also discharged into the Walker Road sewer via a line from the side of the plant.

Sanitary wastes enter the Walker Road sewer via a hookup with the autoclave waste sewer.

Sampling and Analysis

Composite and grab samples were obtained of several flows within and from this plant. These were:

(1) Effluent from tempered glass manufacturing area after passing through the settling tanks.

(2) Autoclave effluent before Walker Road sewer and before the inclusion of sanitary sewage.

(3) Autoclave effluent at the collection sump inside the plant.

The analytical results are as follows:

Sample Number	Solids		pH at Lab.	Ether Solubles	Phenols in ppb
	Total	Susp.			
1	2,336	20	7.2	4	-
2	350	24	8.3	7	0
3	-	-	-	719	24

DISCUSSION OF RESULTS

The effluents from the tempered glass grinding area and the autoclave area appear to be acceptable for discharge to the municipal sewage system.

The low ether soluble content in the effluent from the autocalve area can be attributed to the extra time that the windshields are allowed to stand over a catch basin before being subjected to the detergent-water mixture, plus the fact that this waste is diluted (40:1) with uncontaminated cooling waters from the heat exchangers. In the case of the effluent from the grinding area, the retention time in the series of three settling basins explains the low suspended solids content in the flow to the sewer.

CONCLUSION

Wastes from Duplate of Canada Limited appear to be acceptable for discharge to the municipal sanitary sewage system.

GELATIN CAPSULES LIMITED

Gelatin Capsules Limited is located at 3190 Devon Road and manufactures hard gelatin capsules.

DETAILS OF SURVEY

This plant was visited on February 16, 1968, and samples of the waste effluents were taken.

Personnel Interviewed

Mr. H. Mellen	- Plant Manager
Mr. B. Lorincz	- Manager of Engineering and Development

Description of Plant Processes

Gelatin Capsules Limited manufactures hard gelatin capsules, a majority of which is exported to the United States. The gelatin mixture is formulated in a water-cooled batch reactor and then transported to one of two automatic capsule moulding machines.

Operating Data

Employees	- 25
Operating Schedule	- 24 hours/day 6 days/week

Water Supply and Distribution

Supply	- Windsor Utilities Commission
Volume (average over 1967)	- 2,150 gpd

Distribution

Sanitary and Domestic	500 gpd
Industrial	
Reactor Cooling	
Machine Cooling	1,100 gpd
Products and Washings	550 gpd
	2,150 gpd

Sources, Treatment and Disposal of Liquid Wastes

Gelatin contaminated wastes originate from the washing of the reactor and other parts used in the formulation of the gelatin mixture. These wastes are segregated from cooling water and sanitary wastes and are collected in a holding tank (two such tanks are available at 700 gallons each) for pH adjustment to 8 with sodium hydroxide. The gelatin is hydrolized and the supernatant pumped to a septic tank and tile bed system (600 sq. ft.) for disposal. The solids are land dumped.

Cooling water is used and recirculated in the capsule moulding machines. Only the cooling water used in the batch reactor is discharged to the sanitary sewer. Sanitary sewage is discharged to the septic tank system.

Sampling and Analysis

Two grab samples were taken:

1. Cooling water discharge from the gelatin reactor.
2. Gelatinous wastes from the holding tank before neutralization.

The analytical results of the samples are outlined on the following page.

Sample Number	Solids		BOD_5	pH
	Total	Susp.		
1	216	4	30	9.3
2	482	67	360	7.6

All analyses except pH recorded in parts per million

CONCLUSIONS AND REMARKS

The cooling water from the reactor is acceptable for discharge to a sanitary sewer. As a rule, the discharge of uncontaminated cooling waters to the sanitary sewers should be avoided wherever possible since they tend to take up useful hydraulic capacity at the sewage treatment facilities. However, in view of the small flow from this plant and the nonexistence of any storm sewers in the area, this practice is tolerable.

Since the contents of the holding tank were disposed of through a septic tank and tile bed system, no industrial wastes were discharged to a sanitary or storm sewer.

J. CLARK KEITH GENERATING STATION

This thermal generating station is situated on Sandwich Street West in Windsor.

DETAILS OF SURVEY

This plant was visited on May 8, 1968 and a sample of the waste effluent to the Detroit River was taken.

Personnel Interviewed

Mr. C. Wilson	-	Operating Superintendent
Mr. J. Jorston	-	Station Chemist

Description of Plant Processes

The operation in this power plant involves the generation of heat from coal to produce steam. This steam is used to drive turbines, which in turn, are coupled to generators to produce electricity.

Operating Data

Number of Employees	-	approximately 50
Operating Schedule	-	7 days/week
		24 hours/day

Water Supply and Distribution

Source	-	Detroit River and Municipal Supply
Volume		
Detroit River	-	13,500,000 gpd (April 1968)
Windsor Utilities Commission	-	1,000 gpd

Distribution

Domestic	1,000 gpd
Cooling	13,440,000 gpd
Other Uses	60,000 gpd
	13,501,000 gpd

Sources of Liquid Wastes, Treatment and Disposal

Cooling water makes up the major portion of the water used in this plant. This waste is discharged directly to the Detroit River.

Fly ash and bottom ash, produced from the burning of coal, is slurried with water and pumped to a settling pond. This pond is approximately 5 acres in area and is 20 feet deep. The overflow from this pond is directed to the Detroit River.

Other sources of wastes from this plant include boiler blowdown, softener backwash, drainage from coal storage and equipment cleaning solutions. These are directed to the Detroit River.

Domestic wastes are discharged to a sanitary sewer on Sandwich Street.

Sampling and Analysis

A grab sample was taken of the overflow from the ash settling basin discharging to the Detroit River. The analytical results of this sample were:

Suspended Solids	- 9 ppm
pH	- 8.1

CONCLUSIONS, REMARKS AND RECOMMENDATIONS

The cooling water is discharged to the Detroit River at an elevated temperature. For instance in the month of April 1968, the average inlet temperature was 48°F whereas the average outlet temperature was 66°F. The volume of the cooling water discharged would vary depending on the temperature of the Detroit River.

The quality of the waste from the settling pond appears to be acceptable for direct discharge to the Detroit River.

R. P. SCHERER LIMITED

This Company is located at 1370 Argyle Road and produces soluble gelatin capsules containing general pharmaceuticals.

DETAILS OF SURVEY

Personnel Interviewed

Mr. H. H. Larsen - Vice-President

Description of Plant Processes

Gelatin mixtures are prepared and melted in portable stainless steel tanks. These tanks are connected to the capsule machine and are completely drained. The capsule machine cuts, shapes and simultaneously fills and seals the soft gelatin capsules. After filling, the capsules are then hardened by a dehydrating solvent and dried. The solvent are recovered by a distillation process and re-used.

Operating Data

Employees	-	50
Operating Schedule	-	8 hours/day 5 days/week (Two small shifts work around the clock)

Water Supply and Distribution

Source	-	Windsor Utilities Commission
Volume (average over 1967)		11,000 gpd (approximately)

Distribution

Sanitary and Domestic	1,000 gpd
Industrial	
Gelatin Meter Washings	120 gpd
Laboratory	1,000 gpd
Vacuum Pump and Air Conditioning	3,880 gpd
Washing of Floor and Equipment	5,000 gpd
	11,000 gpd

Sources of Liquid Wastes and Disposal

Wastes originate from plant floor and equipment cleaning operations. The most contaminated waste arises from the washing of the gelatin melter tanks. The total effluent is directed to the sanitary sewer on Argyle Street.

The bottoms of the solvent distillation are collected and removed as a road conditioning agent.

Sampling and Analysis

A grab sample of the gelatin melter tank washings was taken. The analytical results were as follows:

BOD_5	Solids		COD	pH
	Total	Susp.		
5,600	5,206	116	8,250	6

CONCLUSIONS AND RECOMMENDATIONS

Considering the relatively small quantity of contaminated wastes as compared with the quantity of relatively uncontaminated dilution water, the quality of the wastes from this plant is not considered to be objectionable for discharge to the municipal sanitary sewer.

APPENDIX A

INTERPRETATION OF ANALYTICAL RESULTS

A brief discussion of the analytical tests performed on samples collected during the Windsor survey is provided below to assist in interpreting the data contained in the report.

Biochemical Oxygen Demand (BOD_5)

The biochemical oxygen demand is a measurement of the oxygen required to stabilize or render inert the decomposable organic material contained in a waste. The test is carried out over a 5 day period at 20°C. The BOD_5 test is widely used to determine the strength of domestic and industrial wastes as the results give an indication as to the quantity of oxygen needed in a sewage treatment plant or watercourse to stabilize the wastes.

Chemical Oxygen Demand (COD)

The chemical oxygen demand test measures a waste in terms of the total quantity of oxygen required for the stabilization of all oxidizable matter in the waste. It is based on the fact that all organic compounds, with a few exceptions, can be oxidized by the action of strong oxidizing agents under acid conditions.

During the determination of the COD, organic matter is converted to carbon dioxide and water regardless of the biological assimilability of the substances. As a result, COD values are higher than BOD values and may be much greater when large amounts of non-biodegradeable organic matter is present.

Solids: Total, Suspended, and Dissolved

The usual definition of solids refers to the non-volatile matter that remains as residue upon evaporation of the sample and drying at 103°C to 105°C. A complete solids analysis usually includes tests for total, suspended, and dissolved solids, however, in most cases the suspended solids are determined indirectly. Determination of the amounts of total and dissolved matter is accomplished by making tests on unfiltered and filtered portions of the sample, and the suspended solids are determined by difference.

The effect of suspended solids in water is reflected in the difficulties associated with water purification, deposition in streams and injury to the habitat of fish.

pH

pH is a term used universally to express the acidic or basic strength of a solution. The practical pH scale extends from 0, very acid, to 14, very alkaline, with the middle valve of pH 7 corresponding to exact neutrality (at 25°C). Highly acidic or alkaline wastes may result in corrosion of the sewer lines or precipitation of solids in the sewers or receiving waters, as well as being toxic to aquatic life or sewage treatment process organisms.

Ether Solubles

Oils, greases, fats, waxes, and other related compounds are often present in waste streams as an emulsion, a floating layer, or dissolved in the water. Such organics can often be extracted into an organic solvent such as ether-chloroform mixtures, following which the solvent is evaporated off and the residue weighed. The final result is not a measure of any specific compound but is a useful parameter in estimating the relative degree of pollution by various organic compounds, mainly oils and greases. Such material, if present in a

waste discharge will affect the aesthetic qualities of the receiving stream, result in taste and odour problems or interfere with the operation of a municipal sewage treatment system.

Phenols

Phenols and phenolic compounds, including cresols and higher hydroxy derivatives of benzene which react with Gibbs reagent (2, 6 dibromoquinone chlorimide) are present in the waste flows from many industrial processes. Dependent on the concentration, the presence of phenolic compounds may be toxic to aquatic life and may taint the flesh of fish. In addition, phenols present in very minute concentrations will combine with chlorine to produce intensely disagreeable tastes and odours in water.

Cyanides

Cyanides are not natural components of surface waters and if they are present, industrial pollution is indicated. Cyanides are one of the most toxic components of industrial wastes, and it has been reported that fish cannot live indefinitely in water containing as little as 0.1 ppm of cyanide ion. Low concentrations of cyanides can react with acids in sewers to form hydrogen cyanide gas which can be highly dangerous to sewage system workers. Because of the hazards associated with cyanides, they must be almost completely eliminated from industrial waste discharges.

Metals

Heavy metals such as copper, chromium, nickel, cadmium, lead, and zinc, are extremely toxic to aquatic life and to the organisms responsible

for the biological processes in a sewage treatment plant. It is, therefore, essential that the safe upper limits, (which range between 1 and 10 ppm depending upon the particular metal) be adhered to for industrial discharges to either a sewer or watercourse.

APPENDIX B

SUMMARY OF INDUSTRIES VISITED NOT HAVING SIGNIFICANT PROCESS WASTES

NAME OF INDUSTRY	PRODUCT	DISCHARGE LOCATION	WATER WASTES (GPD) SANITARY	WATER WASTES (GPD) INDUSTRIAL	REMARKS
ACE PAINT FINISHERS LIMITED	AUTO & TRUCK MIRRORS	COMBINED SEWERS	200	5,000	ALKALI AND CHROMIC ACID DUMP ONCE EVERY SIX MONTHS
AMCHEM PRODUCTS INC.	METAL TREATING CHEMICALS	SEPTIC TANK & STORM SEWERS	300	6,500	COOLING WATER ONLY.
AMERICAN-STANDARD PRODUCTS (CANADA) LTD.	INDUSTRIAL AIR HANDLING EQUIPMENT	COMBINED SEWERS	2,500	15,000	WATER USED FOR COOLING, HEATING AND TESTING PURPOSES.
AUTO SPECIALTIES MFG. CO. (CANADA) LTD.	MALLEABLE IRON CASTINGS	COMBINED SEWERS	6,000	65,000	WATER USED FOR COOLING PURPOSES, IN SAND MOULDS AND FOR DUST REMOVAL. THE LATTER IS NOT SEWERED.
AJEM LABORATORIES (CANADA) LTD.	CHEMICAL DISTRIBUTOR	COMBINED SEWERS	200	-	MAY START MANUFACTURING OF CHEMICALS IN 1968.
ARMOR PRODUCTS	PAINT PREPARATION	SEPTIC TANK	N.A.	N.A.	DRY INDUSTRY
ARMSON IRON WORK LTD.	SCAFFOLDINGS	SANITARY SEWERS	500	2,000	BATCH DUMPS OF PHOSPHATES AND BONDERITE SOLUTIONS (ONCE/YEAR), CONTINUOUS RINSES TO SEWERS.
ADMIRAL STEEL PRODUCTS	WAREHOUSE	SEPTIC TANK SYSTEM	100	-	DRY INDUSTRY
ACROLAB INSTRUMENT COMPANY	INDUSTRIAL INSTRUMENTS	COMBINED SEWERS	100	N.A.	THE DAILY WATER USE IS ABOUT 3000 GPD BUT INDUSTRIAL USE IS UNKNOWN

SUMMARY OF INDUSTRIES VISITED NOT HAVING SIGNIFICANT PROCESS WASTES

NAME OF INDUSTRY	PRODUCT	DISCHARGE LOCATION	WATER WASTES (GPD) SANITARY	WATER WASTES (GPD) INDUSTRIAL	REMARKS
BANNER METAL PRODUCTS	DIE CASTINGS	SANITARY SEWERS	1,000	50,000	ONLY INDUSTRIAL COOLING WATER.
B & K HYDRAULIC LTD.	HYDRAULIC SYSTEMS	COMBINED SEWERS	180	-	DRY INDUSTRY.
BRENNER PACKERS	MEAT PACKERS	COMBINED SEWERS	100	4,500	ONLY WASH-UP WATERS. SOME CONTAMINATION.
BORDER TOOL & DIE LTD.	TOOL & DIE	SEPTIC TANK	1,000	-	DRY INDUSTRY.
BUDD METAL TREATING	HEAT TREATING OF METALS	ROADSIDE DITCHES	1,000	100,000	COOLING WATER IN HEAT TREATMENT
BUDD MACHINE TOOL CO. LTD.	TOOL AND DIE	SEPTIC TANK	500	-	DRY INDUSTRY
BORDER CITIES WIRE AND IRON LTD.	STEEL AND WIRE	COMBINED SEWERS	500	2,000	COOLING WATER ONLY.
BURMAC MANUFACTURING LTD. AND SEMTEC LTD.	TOOL AND DIE	SEPARATE SEWERS	100	-	DRY INDUSTRIES

SUMMARY OF INDUSTRIES VISITED NOT HAVING SIGNIFICANT PROCESS WASTES

NAME OF INDUSTRY	PRODUCT	DISCHARGE LOCATION	WATER WASTES (GPD) SANITARY	WATER WASTES (GPD) INDUSTRIAL	REMARKS
CANADIAN BOOSTER CO. LTD.	HAIR TONICS	COMBINED SEWERS	120	380	WASH-UP WATERS
CENTRI-SPRAY CANADA LIMITED	WATER POLLUTION CONTROL EQUIPMENT	COMBINED SEWERS	2,000	1,000	EQUIPMENT TESTING.
CENTER TOOL & MOLD CO. LTD.	TOOLS AND MOLDS	COMBINED SEWERS	1,500	1,800	COOLING WATER USED ON BORING MACHINE
COPE & GURR MACHINERY COMPANY LTD. AND PRESSED STEEL PRODUCTS CO.	METAL STAMPINGS	COMBINED SEWERS	250	350	COOLING WATER ONLY.
CROSS SUPPLIES & PAVING LTD.	CONSTRUCTION	COMBINED SEWERS	600	10,000	WATER USED FOR MAKING REDI-MIX CEMENT.
CANADIAN COLD FORGINGS LTD.	VALVE RETAINERS	FIELD TILE SYSTEM	1,000	9,000	WATER USED FOR RINSING IN PHOSPHATING LINE. SOME ZINC AND PHOSPHATE CONTAMINATION
CANADIAN ENGINEERING AND TOOL CO. LTD. AND CANADIAN KRUEGER MACHINE TOOLS (WINDSOR) LTD.	TOOL & DIES FIXTURES	SEPTIC TANK AND FIELD TILE	1,000	-	NO INDUSTRIAL WASTES
CHRYSLER SPRING TRIM LTD.	AUTOMOTIVE TRIM	COMBINED SEWERS	7,000	125,000	COOLING WATER USED IN SPOT WELDERS
CUNO LIGHTER CO. LTD.	CIGARETTE LIGHTERS	COMBINED SEWERS	100	-	DRY INDUSTRY

SUMMARY OF INDUSTRIES VISITED NOT HAVING SIGNIFICANT PROCESS WASTES

NAME OF INDUSTRY	PRODUCT	DISCHARGE LOCATION	WATER WASTES (GPD) SANITARY	WATER WASTES (GPD) INDUSTRIAL	REMARKS
DAAL PLASTICS LTD.	PLASTIC AUTO PARTS	SEPARATE SEWERS	1,600	200	ONLY COOLING WATER
DAAL SPECIALITIES LTD.	SEAT BELTS	SEPARATE SEWERS	600	1,400	WATER USED FOR WASHING PARTS. LITTLE CONTAMINATION
DETROIT METALCRAFT PROCESS ONT. LTD.	METAL ETCHINGS	SEPTIC TANKS AND STORM SEWERS	N.A.	-	DRY INDUSTRY
DOMINION TWIST DRILL LIMITED	DRILLS	COMBINED SEWERS	8,000	2,000	DUMP OF CLEANER ONCE/MONTH.
DOMINION FORGE COMPANY	FORGINGS	COMBINED SEWERS	10,000	500,000	WATER USED TO GENERATE STEAM AND COOLING WATER. MORE IN-PLANT SAMPLING IS NEEDED AT THIS PLANT.

SUMMARY OF INDUSTRIES VISITED NOT HAVING SIGNIFICANT PROCESS WASTES

NAME OF INDUSTRY	PRODUCT	DISCHARGE LOCATION	WATER WASTES (GPD) SANITARY	WATER WASTES (GPD) INDUSTRIAL	REMARKS
ELECTROLINE MFG CO.	ELECTRICAL EQUIPMENT STAMPING	COMBINED SEWERS	1,500	28,000	ALL INDUSTRIAL WATER USAGE FOR COOLING PURPOSES.
ESSCO STAMPING PRODUCTS LTD.	STAMPINGS	COMBINED SEWERS	1,000	55,700	ONLY COMPRESSOR AND OTHER EQUIPMENT COOLING WATERS.
FABRICATED STEEL PRODUCTS (WINDSOR) LTD.	METAL STAMPINGS	SEPTIC TANK AND STORM SEWERS	7,000	11,000	COMPRESSOR COOLING WATERS ONLY.
FLAG FIRE EQUIPMENT LTD.	FIRE EXTINGUISHERS	COMBINED SEWERS	500	500	WATER USED FOR LEAK TESTING.

SUMMARY OF INDUSTRIES VISITED NOT HAVING SIGNIFICANT PROCESS WASTES

NAME OF INDUSTRY	PRODUCT	DISCHARGE LOCATION	WATER WASTES (GPD) SANITARY	WATER WASTES (GPD) INDUSTRIAL	REMARKS
GENERAL FIRE EXTINGUISHER CORP (CANADA) LTD.	FIRE EXTINGUISHERS	SEPARATE SEWERS	1,000	9,000	COOLING WATER ON SIX COMPRESSORS AND SEVEN WELDERS. PAINT BOOTH TAKEN AWAY BY LAND DISPOSAL CONTRACTOR.
G. L. PROCESSING LIMITED	HEAT TREATING OF FORGED PARTS	COMBINED SEWERS	200	80,000	COOLING WATER FOR BEARINGS IN FURNACE ROLLERS.
GLOBE SHEET METAL CO. LTD.	WASHERS AND PAINT FINISHING SYSTEMS	COMBINED SEWERS	100	200	COOLING WATER.
GREAT LAKES FORGINGS	DROP FORGINGS	COMBINED SEWERS	1,000	6,000	WATER USED FOR COOLING AND STEAM GENERATION FOR STEAM HAMMERS.
GENASCO COMPANY	DETERGENT FORMULATIONS	COMBINED SEWERS	100	100	HOME OPERATION, NO SIGNIFICANT WASTES.
HANDEE PLASTIC PRODUCTS (COTTON CORP LTD.)	PLASTICS AND GLUE	COMBINED SEWERS	N.A.	N.A.	PRESUMED DRY INDUSTRY.
HINTON LIGHTER CO.	CIGARETTE LIGHTERS	COMBINED SEWERS	N.A.	N.A.	NO INDUSTRIAL WATER USAGE.
HEWITT METALS CORP.	METAL WORKING	COMBINED SEWERS	100	-	DRY INDUSTRY.

SUMMARY OF INDUSTRIES VISITED NOT HAVING SIGNIFICANT PROCESS WASTES

NAME OF INDUSTRY	PRODUCT	DISCHARGE LOCATION	WATER WASTES (GPD) SANITARY	WATER WASTES (GPD) INDUSTRIAL	REMARKS
HULL-THOMSON LTD.	MOULDINGS AND TRIM	COMBINED SEWERS	500	3,600	COOLING SPOT AND PROJECTION WELDERS.
HOLCOK SHEET METAL LTD.	SHEET METAL	SEPTIC TANK AND TILE BED	200	-	DRY INDUSTRY
HURON STEEL PRODUCTS COMPANY LIMITED	METAL STAMPINGS	COMBINED SEWERS	1,000	5,000	COOLING FOR WELDERS AND COMPRESSORS.
HELIN TACKLE CO. LTD.	FISHING TACKLE	N.A.	100	-	NO PLATING OPERATIONS
INTERNATIONAL TOOLS LTD.	TOOL & DIE	SEPARATE SEWERS	10,000	25,000	COOLING WATER IS MAIN SOURCE OF WASTE. COOLANT DUMPED EVERY SIX WEEKS.
INTERCHEM CANADA LTD. (FINISHES DIVISION)	PIGMENTS	COMBINED SEWERS	2,500	34,500	COOLING AND CONDENSOR WATERS ONLY. BATCH DUMPS OF 300 GALLONS OF CAUSTIC CLEANER EVERY MONTH.

SUMMARY OF INDUSTRIES VISITED NOT HAVING SIGNIFICANT PROCESS WASTES

NAME OF INDUSTRY	PRODUCTS	LOCATION	WATER WASTES (GPD) SANITARY	WATER WASTES (GPD) INDUSTRIAL	REMARKS
KARDAM MFG. CO.	TOOL AND DIE	SEPTIC TANK SYSTEM	200	-	DRY INDUSTRY.
KENDAN MFG. LTD.	SCREW MACHINE PRODUCTS	SEPTIC TANK	1,200	-	DRY INDUSTRY.
KAISER JEEP	MILITARY VEHICLES	SEPTIC TANK AND STORM SEWER	2,000	6,000	COOLING WATER PLUS 600 GPD PHOSPHATE SPRAY.
THE KARCO COMPANY LTD.	AUTOMOBILE ACCESSORIES	COMBINED SEWERS	1,000	2,000	COOLING WATER ONLY.
LAMB F. JOS. OF CANADA LTD.	AUTOMOBILE EQUIPMENT	STORM SEWER AND SEPTIC TANK SYSTEM	800	2,200	COOLING WATER TO STORM SEWER.
LINDQUIST BROS. BAIT CO. LTD.	FISHING LURES	SEPTIC TANK SYSTEM	200	-	DRY INDUSTRY.
LAWRASON S. F. AND CO. LTD.	CHEMICAL FORMULATIONS	COMBINED SEWERS	150	200	FLOOR AND EQUIPMENT WASHING.
LORENCE PRODUCTS LTD.	PLASTIC COATED GLOVES	COMBINED SEWERS	1,300	-	DRY INDUSTRY.

SUMMARY OF INDUSTRIES VISITED NOT HAVING SIGNIFICANT PROCESS WASTES

NAME OF INDUSTRY	PRODUCT	DISCHARGE LOCATION	WATER WASTES (GPD) SANITARY	WATER WASTES (GPD) INDUSTRIAL	REMARKS
MERCURY CHEMICAL CO. LTD.	AUTOMOBILE POLISH	COMBINED SEWERS	240	1,800	WASH-UP WASTES.
METRO TOOL CO. LTD. AND MCBRIDE MFG. CO.	AUTO TOOL AND DIE	DRAIN AND SEPTIC TANK SYSTEM	700	3,000	COMPRESSOR COOLING WATERS TO DRAIN.
MGM BRAKES CANADA LIMITED	TRUCK BRAKES	COMBINED SEWERS	1,000	-	NO INDUSTRIAL WASTES.
METASURF CANADA LTD.	DETERGENT FORMULATIONS		100	-	DRY INDUSTRY.
NOVO AUTOMOTIVE PRODUCTS LTD.	AUTO AND TRUCK PARTS	COMBINED SEWERS	1,000	5,500	INDUSTRIAL WATER IS USED FOR COOLING.
OLSONITE CO. LTD.	PLASTIC EXTRUSIONS AND MOULDINGS	COMBINED SEWERS	1,500	4,500	ONLY COOLING WATERS.
PRODUCTION PAINTING CO.	PAINTING AND PACKAGING	COMBINED SEWERS	100	-	DRY INDUSTRY.

SUMMARY OF INDUSTRIES VISITED NOT HAVING SIGNIFICANT PROCESS WASTES

NAME OF INDUSTRY	PRODUCT	DISCHARGE LOCATION	WATER WASTES (GPD) SANITARY	WATER WASTES (GPD) INDUSTRIAL	REMARKS
PERFECTION AUTOMOTIVE PROD. (WINDSOR) LTD. AND PERFECTION TOOL AND DIE	SMALL CASTINGS TOOL AND DIE	COMBINED SEWERS	1,500	1,500	COOLING WATER FOR COMPRESSOR AND SIX FINISHING MACHINES.
RIVERSIDE FABRICATING LTD.	WELDING	SANITARY SEWER	250	-	DRY INDUSTRY.
RAYCO STAMPING PRODUCTS LTD. AND TRISEN TOOL AND DIE LTD.	AUTO STAMPINGS TOOL AND DIE	SEPTIC TANK SYSTEM	3,500	-	DRY INDUSTRY.
RUNDLE (G.H.) AND SON CO. LTD.	LINIMENTS	COMBINED SEWERS	100	1,000	WASH-UP WATER.
REX TOOL AND MOLD LTD.	MOLDS	COMBINED SEWERS	300	-	DRY INDUSTRY
SPECIAL MACHINING CO. (WINDSOR) LTD.	TOOL AND DIE	COMBINED SEWERS	100	1,000	COOLING WATER WITH SOME OIL CONTAMINATION.
STERIL BLEACH	BLEACH	STORM SEWER	100	100	WASH-UP WATER.
SOMERVILLE AUTOMOTIVE TRIM LTD. AND SOMERVILLE INDUSTRIES LTD.	AUTOMOBILE HEATERS PANEL TRIM	COMBINED SEWERS	1,800	13,000	COOLING WATER USED IN AIR-CONDITIONERS AND WATER USED FOR THE BOILER.

SUMMARY OF INDUSTRIES VISITED NOT HAVING SIGNIFICANT PROCESS WASTES

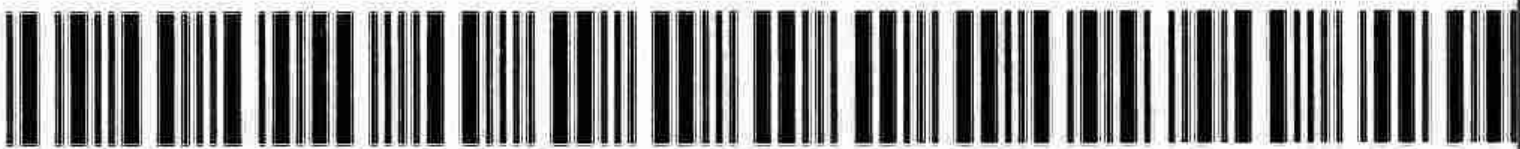
NAME OF INDUSTRY	PRODUCT	LOCATION	WATER WASTES (GPD) SANITARY	WATER WASTES (GPD) INDUSTRIAL	REMARKS
SAPOLINE COMPANY LTD.	SMALL HOUSE-WARES AND PACKAGING OF DRY CHEMICALS	COMBINED SEWERS	200	-	DRY INDUSTRY.
STANDARD INDUCTION CASTINGS LIMITED	IRON CASTINGS	COMBINED SEWERS	1,000	5,000	COMPRESSOR COOLING ONLY.
SUN TOOL & STAMPING (1960) LTD.	AUTOMOTIVE STAMPINGS	STORM SEWERS	500	5,000	COOLING OF WELDING EQUIPMENT AND COMPRESSORS.
TROTHEN CHEMICALS LTD.	INDUSTRIAL CHEMICALS	COMBINED SEWERS	N.A.	N.A.	
TAMCO LTD.	AUTOMOTIVE COMPONENTS	SEPARATE SEWERS	500	1,000	METAL CHIPS AND CUTTING OILS LAND DUMPED.
TECUMSEH METAL PRODUCTS LTD. AND STEEL MASTER TOOL CO. LTD.	METAL STAMPINGS TOOL AND DIE	COMBINED SEWERS	200	2,000	COOLING WATER ONLY.
TOLEDO SEALE CO. OF CANADA LTD.	WEIGHING SYSTEMS	SANITARY SEWERS	1,500	10,000	CONTINUOUS WASTE IS ONLY COOLING WATER. MONTHLY BATCH DUMPS OF 1,000 GALLONS PAINT SPRAY BOOTHS TO SANITARY SEWERS.
TRANS-CONTINENTAL BOLT COMPANY LIMITED AND TRANS-CONTINENTAL FASTENERS CO. LTD.	NUTS, BOLTS AND FASTNERS	COMBINED SEWERS	500	5,000	COOLING WATER RECIRCULATED WITH SOME BLED-OFF TO COMBINED SEWERS. PLATING WASTES RETAINED FOR LAND DISPOSAL BY CONTRACTOR. LOW CYANIDE PLATING BATH USED.
UNIVERSITY PLATEMAKERS AND UNIVERSITY PRESS	OFFSET PLATE MAKING AND PRINTING	COMBINED SEWERS	100	-	DRY INDUSTRY, NO ETCHING SOLUTIONS.

SUMMARY OF INDUSTRIES VISITED NOT HAVING SIGNIFICANT PROCESS WASTES

NAME OF INDUSTRY	PRODUCT	DISCHARGE LOCATION	WATER WASTES (GPD) SANITARY	WATER WASTES (GPD) INDUSTRIAL	REMARKS
VELTRI STAMPING CO. LTD.	METAL STAMPINGS	SEPTIC TANK SYSTEM	50	-	DRY INDUSTRY.
VIKING PUMP CO. OF CANADA LTD.	PUMPS	COMBINED SEWERS	1,000	5,000	COOLING WATER FOR ONE COMPRESSOR AND TEN FINISHING MACHINES. PAINT SPRAY BOOTH SKIMMED AND DUMPED TO THE SEWERS EVERY TWO WEEKS.
VOLTA WELDERS LTD.	WELDING EQUIPMENT	(1) STORM SEWER (2) SEPTIC TANK SYSTEM	1,200	3,000	(1) WATER USED FOR TESTING EQUIPMENT (2) SANITARY SEWAGE.
VICTORIA STEEL PRODUCTS LTD.	WAREHOUSE	SANITARY SEWERS	200	-	DRY INDUSTRY.
VALCO MFG. LTD. AND VALIANT MACHINE & TOOL CO. LTD.	TOOLS	SEPTIC TANKS AND STORM SEWERS	N.A.	N.A.	
WINDSOR MACHINE & STAMPING LTD.	LINKAGE AND THREADED RODS	COMBINED SEWERS	300	1,600	ONLY COOLING WATERS.
WOOD (PHIL) INDUSTRIES LTD.	SMALL TRUCK EQUIPMENT	SEPTIC TANK AND STORM SEWERS	1,000	2,000	COOLING WATER ON COMPRESSOR.

SUMMARY OF INDUSTRIES VISITED NOT HAVING SIGNIFICANT PROCESS WASTES

NAME OF INDUSTRY	PRODUCT	DISCHARGE LOCATION	WATER WASTES (GPD) SANITARY	WATER WASTES (GPD) INDUSTRIAL	REMARKS
WINDSOR MATCH PLATE AND TOOL LTD.	TOOL AND DIE	COMBINED SEWERS	600	2,500	COOLING WATER ONLY.
WHEEL TRUEING TOOL CO. OF CANADA LTD.	DIAMOND DRILLS	COMBINED SEWERS	1,000	17,000	WATER USED FOR COOLING PURPOSES ON INDUCTION UNIT, GENERATOR AND WELDERS.
WINDSOR TOOL & DIE LTD.	RADIATOR CAPS AND DIES	COMBINED SEWERS	3,500	22,000	WATER USED FOR COOLING ON WELDERS, DIE CAST MACHINES AND AIR CONDITIONERS.
WELLES CORPORATION LTD.	SCHOOL BUSES AND TRUCK BODIES	COMBINED SEWERS	3,000	15,000	COOLING WATER FOR TWO COMPRESSORS. DUMPS OF PAINT SPRAY BOOTH ONCE PER WEEK IN SUMMER AND ONCE EVERY FOUR MONTHS IN WINTER.
WRIGLEY STEEL CO. OF CANADA	STEERING WHEELS	COMBINED SEWERS	200	6,000	COOLING PURPOSE ONLY.
ZALEV BROS. LTD.	PROCESSING OF SCRAP METAL	(1) SEPTIC TANK SYSTEM (2) STORM DRAIN	1,000	40,000	(1) SANITARY SEWAGE (2) COOLING WATER POSSIBILITY OF OIL CONTAMINATION FROM STOCKPILE OF METAL FILINGS.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